

Bodyweight concerns: examination of the psychometric properties of weight concerns scale in samples of Turkish athletes and university students

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Summary. *Study Objectives:* Bodyweight concerns are common among people with eating disorders. This structure, which is in the common field of exercise psychology and nutrition, can be evaluated using self-report-type measurement tools. The Weight Concerns Scale (WCS) is often used to assess bodyweight concerns. To evaluate the psychometric characteristics of WCS in the sample of Turkish female university students and athletes; this study aims to adapt the scale of bodyweight concerns in Turkish culture. *Methods:* Confirmatory factor analysis was conducted for the research. Factorial, convergent, and predictive validity and reliability were evaluated. Also, within the scope of the reliability analysis, the Cronbach's alpha internal consistency value was calculated. The invariance between samples of university students and athletes was tested by multi-group analysis. 446 female students and 398 female athletes voluntarily participated in the study. The psychometric properties of the WCS were sufficient for Turkish university students and athletes. WCS intergroup invariance was verified. *Results:* The psychometric properties of the WCS were sufficient for Turkish university students and athletes. WCS intergroup invariance was verified. *Conclusion:* It was determined that the Turkish form of the WCS can be used in the sample of Turkish students and athletes. WCS intergroup invariance was verified. In other words, the results show that it is an instrument that is simple to fill, requires minimum practice time, and can evaluate bodyweight concerns related to body image for Turkish university students and athletes.

Key words: Weight Concerns, Body image, Obesity

Introduction

Body image is an abstraction that is difficult to explain and there is no widely accepted definition (1). Body image can be defined as a person's thoughts about how the body looks to others, or feelings and attitudes towards one's own body (2). The structure of the body image expresses a dynamic process that includes a combination of the experiences included in the life of the individual and the meanings that the individual attributes to these experiences (3).

Body image has a very effective structure. Therefore, body image structure was estimated based on the

evaluation of certain characteristics (4). Despite being preoccupied with BodyWeight, weight is not only involved in the building of body image but can have a powerful effect on the building process, and therefore this factor is considered to be a potentially interesting strategy (5). Bodyweight and body dissatisfaction can affect the quality of life of the individual with changes in body image. This situation may later contribute to the development and/or protection of body image disorders (6). Today, men and women are eager to make changes to their bodies. It can be said that the main reason for this willingness is body worries. When it comes to body worries, it can be said that

the body anxieties of women increase, especially before the adolescence and adolescence period. It is known that during this period, women wanted to differentiate and change their bodies. Accordingly, it can be said that women in this period were extremely vulnerable (7). This period coincides with entering university education, which can lead to gaining autonomy/independence and adaptation to new groups and new life context, anxiety to adapt, and stress situations, respectively (8). In this direction, it is stated that students who have just started university studies tend to gain weight compared to the pre-university period (9-10). Due to these reasons, it is extremely important to control bodyweight anxiety and eating behavior in students who are just starting their university life.

It is stated that adolescent girls frequently complain of their bodyweight during this period and attempt to change their diet negatively accordingly. It is stated in researches that nutritional disorders occur exactly during this period (11). Aiming to assess this concern, the researchers proposed a tool called the Weight Concern Scale (WCS). Using whether there is an eating disorder as a criterion, the researchers stated that the test-retest reliability of the total WCS score was .86. However, after the development of WCS, Dias, da Silva, Maroco, and Campos (2015) published a study by seeing this deficiency in the sample of Brazilian students (12). They provided hard evidence regarding the validity and reliability of WCS in their research.

In this direction, validity and reliability analysis of the measurement tools included in the research should be done for the results of the studies to be valid and reliable. In other words, the psychometric competencies of measurement tools are extremely important (13-14). WCS is available only in English and Portuguese versions in the literature. Its only application has been in the context of American and Brazilian participants. The psychometric properties factors, convergent and concurrent validity of the scale have not been adequately evaluated with similar scales, and there is no Turkish version of this scale. For this reason, this research aims to adapt WCS to Turkish culture and to examine the psychometric properties of the Turkish form of WCS in the sample of university students and athletes (above 18 years old). In addition, within the scope of the research, it is aims to examine the

measurement change in the sample of students and athletes of WCS.

Material and Methods

Participants

A total of 446 (Age: 21.69 ± 2.15 year; Height: 166 ± 6.52 cm; Bodyweight: 59.59 ± 9.69 kg; Body mass index: 23.69 ± 4.27 kg/m²) female university students and 398 (Age: 22.51 ± 2.49 year; Height: 174.54 ± 6.59 cm; Bodyweight: 78.98 ± 15.87 kg; Body mass index: 25.73 ± 3.77 kg/m²) athletes who actively participated in the competitions participated in the study voluntarily. In addition, to test the test-retest reliability of the scale, WCS was administered to 30 people (15 female students and 15 female athletes) selected from the sample at 3-week intervals. Information about the female students and athletes participating in the study is included in Table 1.

Measures

Demographic form: Through the demographic information form created by the researchers, it was aimed to reach some information of the participants (e.g. height, weight, experience, and age). All participants who wanted to participate in the study voluntarily filled this form (i.e. height, weight, experience and age).

Weight concerns scale (WCS): The Weight Concerns Scale (10) is used to evaluate and shape the bodyweight concerns of the participants, to determine the fear of gaining weight, dietary behavior, and perceived obesity level. The scale consists of 5 items. Increasing scale scores means increasing bodyweight concerns. The highest score that can be obtained from the scale is 26, and the lowest score is 5. This scale has a good test-retest correlation ($R = .71$ for 7-month interval measurement) among adolescent girls (11-15).

Negative body talk scale (NBTS): "Negative Body Talk Scale (NBTS)" is a scale developed by Engeln-Maddox, Salk, and Miller (2012) to measure the level of speech of individuals regarding their bodies (16). NBTS consists of 13 items and 2 sub-dimensions.

Body Concerns sub-dimension, which is the first sub-dimension, consists of 7 items in total. The Body Comparison sub-dimension, which is the second sub-dimension of NBTS, consists of 6 items in total. The original language of the scale is English. Before the scale adaptation process, permission for the adaptation of the original form was obtained via e-mail. The scale items are scored in 7-point Likert type with “Never (1)” and “Always (7)”. It was adapted to Turkish by Baykose and Yazici (17).

Procedure

“Ethics Committee Approval” dated 18.01.2021, numbered 186 was obtained from Akdeniz University Social and Human Sciences Scientific Research and Publication Ethics Committee. After the permit process, the adaptation studies of the WCS have been started. The translation process in two directions (translation-back translation) was carried out for the language equivalence of WCS (18). Accordingly, the translation of the scale by the first translator was evaluated by two evaluators who are experts in sports psychology and sports sciences along with alternative recommendation options following the “supervision of translation by other translators” method. The scale, which was finalized after the adjustments made by the first author in line with the expert recommendations, was translated into English by another expert in the field of sports psychology who is fluent in both languages. The Turkish and English translations of the scales were close to each other and the research process was initiated. The university sample and the athlete sample were reached separately, and the form created for the research was applied to the students and athletes by the researchers. Additionally, the study was conducted by the guidelines of the revised Helsinki Declaration.

Statistical analysis

Descriptive statistics were made using SPSS v23. Later, the means, standard deviations, item variance, skewness, and kurtosis indicators of normality were determined. To determine the normality of the distribution of research data, the case of skewness and kurtosis between -1.96 and +1.96 was evaluated (19).

Cronbach’s alpha coefficient and McDonald’s ω values were calculated to analyze item and scale reliability; Cronbach’s alpha coefficient and McDonald’s ω values of .70 and above were considered acceptable (20-21). Pearson’s correlation coefficient r was used to calculate convergent validity and test-retest reliability. Values between .10 and .30 indicate a weak relationship, a medium relationship between .30 and .50, and a strong relationship between .50 and .70. For test-retest reliability, and value above .80 indicates a high reliability of the scale (22).

A CFA (Confirmatory Factor Analysis) was performed to investigate the original single-factor model of WCS. A maximum probability prediction method was used. Analyses were calculated with jamovi v1.6.15 software, which includes the lava package (23). The reported model fit indices χ^2 , CFI, TLI, and RMSEA were used. A χ^2 /sd ratio of less than 5 was used to evaluate the model fit (24). For CFI and TLI, values above 90 indicate acceptable fit (25). For RMSEA, values between .05 and .08 indicate acceptable fit (26). In addition, measurement invariance between research groups was examined with multiple DFA. For this purpose, following Brown’s recommendations (27) and using AMOS software version 20.0 (IBM Corp.), five levels of invariance (configural, metric, scalar, partial and strict invariance) were tested sequentially. Structural invariance refers to the similarity at the factor structure level, and metric invariance refers to the similarity at the factor loading level. The similarity of indicator intersections has been named scalar invariance and the similarity of indicator residues as rigid invariance (27). The invariance models were compared in terms of $\Delta\chi^2$ and Δ CFI values, considering that Δ CFI value is independent of the sample size, Δ CFI value was used in the study (28). A Δ CFI \leq -.01 was taken as the reference to support invariance levels and indicated a non-significant decrease in model fit (28).

The estimation validity of body mass index scores for weight concerns was evaluated using linear regression models. The main reason for using BMI for predictive validity is that many researchers have reported in the literature that the BMI value is associated with negative body image (29-30-31). In line with this information, all variables distribution normality and basic assumptions of linear regression analysis are provided.

Results

When the descriptive statistics and normality values of the research group are examined (Table 1), it is seen that the skewness and kurtosis values of WCS are between -1.96 and +1.96. In this context, it can be stated that the scores were normally distributed (19).

Separate models were tested for all of the research groups, only the student group, and only the athlete group. According to the confirmatory factor analysis (Table 2), the model fit index indicates a good fit in three different groups.

Analysis was carried out on data of athletes and students to determine whether WCS differed structurally according to the sample of athletes and students. In the comparison of invariance between groups (Table 3), the RMSEA index and χ^2/sd ratio of the athlete sample have a better value than the student sample. In addition, the χ^2/sd ratio was less than 5 for both samples (24), and the RMSEA index was less than .08 for both samples (26). For this reason,

we conducted invariance analysis. The invariance of configural invariance was supported, as all reported fit indices reflect adequate fit ($\chi^2=35.85$, $df=10$, $CFI=.978$, $TLI=.959$, $RMSEA=.055$). Metric invariance was also assumed due to an insignificant decrease in model fit (p value $\geq .05$ and $\Delta CFI \leq -.01$ for $\Delta \chi^2$). Scalar and rigid invariance data revealed a significant difference in χ^2 from one model to the next; however, ΔCFI , independent of sample size, had marginally recommended values to support these levels of invariance (28).

Convergent validity

To assess convergent validity, correlations between the Turkish version of the WCS with five items and the NBTS were examined (Table 4). As expected, there were significant positive correlations between WCS scores and body concern ($r = .30$, $p < .001$) and body comparison ($r = .34$, $p < .001$) NBTS sub-dimensions. The strongest relationship was between body concern and WCS scores.

Table 1. Descriptive statistics of students and athletes

	Group	Age	Height	Weight	BMI	WCS1	WCS2	WCS3	WCS4	WCS5
N	Students	446	446	446	446	446	446	446	446	446
	Athletes	398	398	398	398	398	398	398	398	398
Mean	Students	21.7	166	59.6	23.7	2.22	2.41	2.33	1.67	2.46
	Athletes	22.3	170	61.6	21.2	2.18	2.46	2.79	1.70	2.42
S.d	Students	2.15	6.52	9.69	4.27	1.16	1.11	1.78	.839	1.27
	Athletes	2.89	8.20	10.5	3.21	1.20	1.12	2.38	.790	1.18
Skewness	Students	1.57	.616	1.06	1.15	.684	.463	1.33	1.47	.553
	Athletes	2.04	.435	.659	.760	.665	.418	.940	.775	.384
Kurtosis	Students	8.93	.760	1.36	1.85	-.126	-.074	.831	1.78	-.419
	Athletes	6.96	-.180	-.091	1.80	-.591	-.614	-.801	-.399	-.761

WCS: weight concern scale; BMI: Body mass index

Table 2. Confirmatory factor analysis for students, athletes, and all groups.

	X ²	df	X ² /df	CFI	TLI	SRMR	RMSEA	RMSEA 90% CI	
								Lower	Upper
All Groups	24.8	5	4.96***	.985	.970	.018	.068	.043	.096
Group of student	18.8	5	3,76***	.983	.965	.022	.079	.042	.118
Group of athlete	17.1	5	3.42***	.979	.958	.025	.078	.039	.0120

*** $p < 0.001$

Table 3. Analysis results of measurement invariance for students and athletes

Model	χ^2	Df	RMSEA	CFI	TLI	Δ CFI	$\Delta\chi^2$	Δ df
Women athletes	17.080	5	.078	.979	.958	–	–	–
Women students	18.775	5	.079	.983	.965	–	–	–
Configural invariance	35.85	10	.055	.978	.959	–	–	–
Metric invariance	47.284	14	.053	.976	.962	–.00	11.437	4
Scalar invariance	63.699	18	.055	.967	.963	–.00	16.415***	4
Partial invariance	60.127	17	.055	.968	.963	–.00	3.572	1
Strict invariance	121.042	23	.071	.928	.938	–.01	18.48***	6

Note. *** $p < .001$.

Table 4. Pearson correlations between the research variables.

		WCS	Body Concerns	Body Comparison
WCS	r	—		
	p	—		
Body Concerns	r	0.709	—	
	p	< .001	—	
Body Comparison	r	0.556	0.633	—
	p	< .001	< .001	—

Table 5. Prediction of BMI based on WCS.

Predictor	Estimate	SE	R	R ²	F	df1/df2	t	p
Intercept	-.962	.199	.491	.242	.268*	1/842	-4.83	<.001
BMI	.150	.009					16.37	<.001

Predictive validity, test-retest reliability and internal consistency index

For the Turkish version of the WCS with five items, the Cronbach's alpha internal consistency index was very good (Table 5) ($\alpha = .77$). Also, for the calculated McDonald's ω ($\omega = .82$) value, the results indicated the reliability of the scale. Test-retest reliability of 30 participants (15 students and 15 athletes) for WCS was high three months after the first application ($r = .83$, % 95 CI = [.763, .914]).

When the results of the regression analysis made within the scope of predictive validity were examined (Table 5). To evaluate the predictive validity level of the Turkish version of WCS with five items, we considered WCS scores and BMI values. The general prediction model of BMI created for WCS scores was significant ($F(1,842) = 268.110$, $p = .000$, $R^2 =$

.24). A 0.15 unit increase was observed in the scores obtained from WCS with each unit increase in the scores obtained from the BMI.

Discussion and Conclusion

This study aims to examine the psychometric properties of WCS in a sample of Turkish female university students and athletes and to adapt a measurement tool to evaluate bodyweight concerns in Turkish culture. In the Turkish version of the WCS, it was determined that the original single-factor structure proposed by the authors who developed the scale has good fit indices for our sample.

In line with the findings obtained, it was determined that the scale provided suitable criteria for internal consistency, McDonald's ω value, test-retest

reliability, convergent and predictive validity in terms of psychometric properties. When the findings regarding the measurement invariance were examined, affirmative values were obtained regarding the measurement invariance for university students and athletes.

This research also has some limitations. First of all, some of the psychometric properties have not been studied within the scope of the research yet. The first of these is divergent validity. In addition, the BMI values obtained within the scope of the research were calculated in line with the height and weight values reported by the participants. The participants may be provided incorrect or incomplete information on this subject while completing the research form.

One of the studies on WCS in the literature is the study conducted by Dias, da Silva, Maroco & Campos (2015) on Brazilian university students (12). In this context, the findings of this research support our research.

As a result, it was determined that WCS showed good psychometric properties in samples of Turkish students and athletes. Also, WCS intergroup invariance was verified. In other words, it was determined that the Turkish form of WCS can be used in the sample of Turkish students and athletes. The results show that the WCS is simple to fill in, requires a minimum of practice time, and is a measuring tool that can evaluate bodyweight concerns related to body image for Turkish university students and athletes.

Conflicts of interest: The authors declare that there is no conflict of interest about this manuscript.

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