THE GREEK VERSION OF THE RESTRAINT SCALE: VALIDATION IN A STUDENT SAMPLE IN CYPRUS

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Abstract: The present study examined the factorial structure and construct validity of the Greek version of the 10-item Restraint Scale (RS). One hundred and fifty-three Cypriot university students were administered the RS and other measures. An oblique two-factor model with the Concern for Dieting (CD) and Weight Fluctuation (WF) factors, with Item 6 removed, fitted adequately to the data. The two subscales were found to correlate differentially with other measures. CD had strong correlations with dieting and dieting behaviour, and WF had a moderate association with weight. None of the subscales correlated with measures of exercising and perceived stress. A multidimensional structure of the scale for this sample and the consideration of two subscores instead of a single total score were suggested.

Key words: Dieting, Eating behaviours, Restraint Scale, Weight fluctuation

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INTRODUCTION

Dieting is defined as the attempted restriction of caloric intake aiming at changing body shape and/or weight (Haynos, Field, Wilfley, & Tanofsky-Kraff, 2015). According to the dietary restraint theory, "eating patterns are influenced by both physiological cues that prompt a desire to eat, and cognitively mediated processes that inhibit the desire to eat" (Klem, Klesges, Bene, & Mellon, 1990, p.147). Reliance on the cognitive processes, instead of physiological cues, renders dieters susceptible to uncontrolled eating when these processes are disrupted (Polivy & Herman, 1985).

Evidence suggests that high scores on dietary restraint scales predict the development of eating pathology (Polivy & Heatherton, 2015; Schaumberg & Anderson, 2016). Recent studies suggest that there is a relation between scores on dietary restraint scales and disordered eating behaviours in adolescents (Goldschmidt, Wall, Loth, Le Grange, & Neumark-Sztainer, 2012) and young adults (Liechty & Lee, 2013). Dieting in adolescence is related to binge eating and behaviours such as laxative use, vomiting and use of diet pills in subsequent years (Liechty & Lee, 2013). Research also shows that dietary restriction is related with lower levels of life satisfaction in both males and females (Bentley, Mond, & Rodgers, 2014; Schnettler et al., 2014).

The Restraint subscale of the Three Factor Eating Questionnaire (TFEQ-R; Stunkard & Messick, 1985), and the Restraint subscale of the Dutch Eating Behavior Questionnaire (DEBQ; van Strien, Frijters, Bergers, & Defares, 1986) are two one-dimensional scales that identify dieters who exhibit restriction of food intake consistently (Carvalho, Marques, Ferreira, & Lima, 2016). A third scale, the Restraint Scale (RS; Polivy, Herman, & Warsh, 1978), "identifies dieters who exhibit periods of restraint punctuated by episodes of disinhibited overeating" (Heatherton, Herman, Polivy, King, & McGree, 1988, p. 19), in contrast to the former two scales which focus on successful dieting.

Herman and Polivy (1975) had originally proposed an 11-item scale with two subscales: Diet and Weight History, and a Concern with Food and Eating. The internal consistency of this scale was $\alpha = .75$. The correlation between the two subscales was .48, suggesting that they are measuring two separate dimensions. A revision of the scale with revised scoring and deletion of an item resulted in the most recent 10-item form of the RS (Herman & Polivy, 1980). The self-reported RS consists of two subscales: Concern for Dieting (CD, e.g., 'do you eat sensibly in front of others and splurge alone') and Weight Fluctuation (WF, e.g., 'in a typical week how much does your weight fluctuate'); the former reflects heighted attention to and

emotional association with eating, and the latter the extent of previously-experienced weight gain and loss (Blanchard & Frost, 1983). The rationale for the inclusion of items that represent the two subscales was that individuals concerned with limiting their food consumption may be susceptible to overeating when their cognitive restraint is disrupted, and consequently display a history of weight fluctuation (Lowe, 1984). Therefore, the RS does not measure a single behavioural tendency, but was designed to identify dieters who both restrict food intake and tend to splurge (Heatherton, Herman, Polivy, King, & McGree, 1988). According to Heatherton et al. (1988), the RS has two component factors that are statistically and conceptually related; they measure different aspects of the same construct. The theory associated with the RS provides explanation for the behaviours often seen in individuals with binge eating disorder (Polivy, 1978).

Numerous factor analyses of the RS typically reveal two factors, CD and WF (Carvalho et al., 2016; van Strien, Breteler, & Ouwens, 2002). Items 1, 5, 6, 7, 8, and 9 correspond to CD, while items 2, 3, 4, and 10 to WF. Although van Strien et al. (2002) identified these factors, they deleted item six: "Do you eat sensibly in front of others and splurge alone?" because it refers to disinhibited eating and item 10: "How many pounds over your desired weight were you at your maximum weight?" as it sometimes loaded on the CD factor and sometimes on both factors. Item 10 referred to the history of being overweight, which differs from weight fluctuation (Lowe, 1984). However, other authors found three factors in university students in the US and in adolescents in Hong Kong (Lowe, 1984; Mak & Lai, 2012) or four factors in US university students (Ruderman, 1983).

According to several studies, internal consistency of the RS was satisfactory with Cronbach's alpha ranging from .77 to .86 (Allison, Kalinsky, & Gorman, 1992; Boyce, Gleaves, & Kuijer, 2015; Carvalho et al., 2016; Dinkel, Berth, Exner, & Balck, 2005; Kong, Zhang, & Chen, 2013; Ruderman, 1983). It was found to be lower in obese individuals (.51; Ruderman, 1983), or non-dieters (.50; Johnson, Lake, & Mahan, 1983).

In normal weight samples, the RS correlated strongly with the Eating Disorder Inventory (EDI) drive for thinness; highly with other dieting measures, and moderately with measures of overeating (van Strien, Herman, Engels, Larsen, & van Leeuwe, 2007). When the CD and WF subscales were analysed separately, differential correlations emerged with related constructs, providing evidence of convergent and discriminant validity. The CD subscale correlated strongly (*r*s ranging from .48 to .70) with the TFEQ disinhibition, the EDI bulimia, with the question 'do you diet' (van Strien et al., 2007), the TFEQ-R (Kong et al., 2013), the DEBQ-R (Kong et al., 2013), and the EAT-diet (Mak & Lai, 2012). The corresponding correlations for WF were

low to moderate, .24 to .42, suggesting discriminant validity for the two subscales. Based on these different networks of associations of the two subscales with other measures, Carvalho et al. (2016) supported the multidimensionality of the RS.

The present study

To our knowledge, the RS has not been adapted and validated for use with Greek-speaking populations. Recommended practice in adaptation and cross-cultural validation of scales (e.g., International Test Commission, 2005) suggests the evaluation of evidence based on locally collected data to support the use of scales in new linguistic and cultural contexts. The present study aimed at examining the factorial structure and construct validity of the Greek version of the RS. It was hypothesised that the two-factor model would have the best fit to the data (Hypothesis 1).

Subsequently, the relationship of the RS sub-factors to eating disorder symptomatology, exercise, dieting, weight, Body Mass Index (BMI), sex, depression and perceived stress was investigated. It was hypothesised that CD subscale will be strongly related with dieting measures and WF subscale with weight, both providing evidence of convergent validity (Hypothesis 2).

Additionally, it was hypothesised that CD and WF subscales will not be significantly related to measures of exercising, suggesting discriminant validity for the two subscales (Hypothesis 3).

Depression and perceived stress were also examined as correlates of RS subscales. The former is considered a construct that relates to eating disorders such as anorexia and bulimia nervosa (Bulik, 2002), while the latter was not expected to correlate with RS subscales and would provide evidence for discriminant validity (Hypothesis 4).

METHOD

Participants - Procedure

Data were obtained from a larger study examining the prevalence of eating disorders among college students in Cyprus (Karekla & Kapsou, 2009). Participants were recruited during orientation prior to college entry. All freshmen students were required to attend the orientation program. Research assistants visited the orientation program classes following arrangements with student services, and invited students to participate in the study. All individuals who consented were provided with the packet of questionnaires. The study was approved by the University of Nicosia Bioethics

Committee. In the current paper, responses on the RS and other measures useful for examining construct validity were used.

One hundred and fifty-three student participants (54% females) were recruited from universities in Cyprus and were administered a questionnaire packet, including demographic information and eating related measures. The mean age was 19.13 years (*SD* = 3.07, Range = 17 - 48); the mean height 1.70 m (*SD* = 0.09, Range = 1.52 - 1.91), and the mean weight 64.09 kg (*SD* = 14.82, Range = 43 - 120). Based on participants' weight and height, Body Mass Index (BMI) was calculated using the ratio kg/m^2. For the interpretation of the BMI categories the following ranges were used: Up to 18.49 = Underweight, 18.5 - 24.99 = Normal Weight, 25 - 29.99 = Overweight, and higher than 30 = Obese. Twenty-five participants (18.7%) fell in the 'Underweight' category, 87 (64.9%) in the 'Normal weight' category, 17 (12.7%) in the 'Overweight' category, and 5 (3.7%) in the 'Obese' category. Nineteen participants had missing data on BMI. The majority of the sample stated that they were native Greek-speakers (92.8%), first-year students (95.2%), single (97.3%), were not exercising (56.5%) and were not on a diet at the time of data collection (78.3%).

Measures

The questionnaires were adapted in Greek using the method of forward and backward translation by senior psychology students, bilingual in English and Greek. Where relevant, permissions to use the instruments in this study were obtained by the original authors.

Restraint Scale
Participants completed the 10-item Restraint Scale (RS; Herman & Polivy, 1980). Items 1, 5, 6, 7, 8, and 9 correspond to Concern for Dieting (CD) and items 2, 3, 4, and 10 to Weight Fluctuation (WF). Some of the questions included in the RS are: "How often are you dieting?", "Do you have feelings of guilt after overeating?" Items 1 to 4 and 10 are rated on a five-point Likert-type scale ranging from zero to four. Items 5 to 9 are rated on a four-point Likert-type scale ranging from zero to three. A total score is computed by summing item scores, with a maximum total score of 35. Those who score 16 and more are considered as restrained eaters and those who score 15 and less as unrestrained eaters (Coletta et al., 2009). As mentioned in the introduction, reliability estimates for the RS have been found to be adequate (α = .77 to .86) across a range of samples. Test-retest reliability was found to be .95 for a period of two weeks (Allison et al., 1992) and .93 for a four-week interval (Kickham & Gayton, 1977).

The Beck Depression Inventory

The Beck Depression Inventory (BDI-II; Beck, Steer, & Brown 1996) is designed to measure the intensity, severity and depth of depression. It consists of 21 groups of statements, e.g., I do not feel sad, I feel sad much of the time, I am sad all the time, I am sad or unhappy that I can't stand it, each with four possible responses ranging from zero to three, indicating the severity of symptoms. High scores indicate more severe depressive symptoms. The BDI-II consists of two factors: Cognitive-Affective and Somatic-Vegetative. The original validation of the BDI-II showed good internal consistency (Cronbach's alpha = .92 for outpatients and .93 for nonclinical sample). In Greek university students, it was found that the scale had a satisfactory internal consistency (Cronbach's alpha = .92; Giannakou et al., 2013). For the current study Giannakou et al.'s adaptation of the BDI-II was used. Cronbach's alpha of BDI-II in the present study was .91.
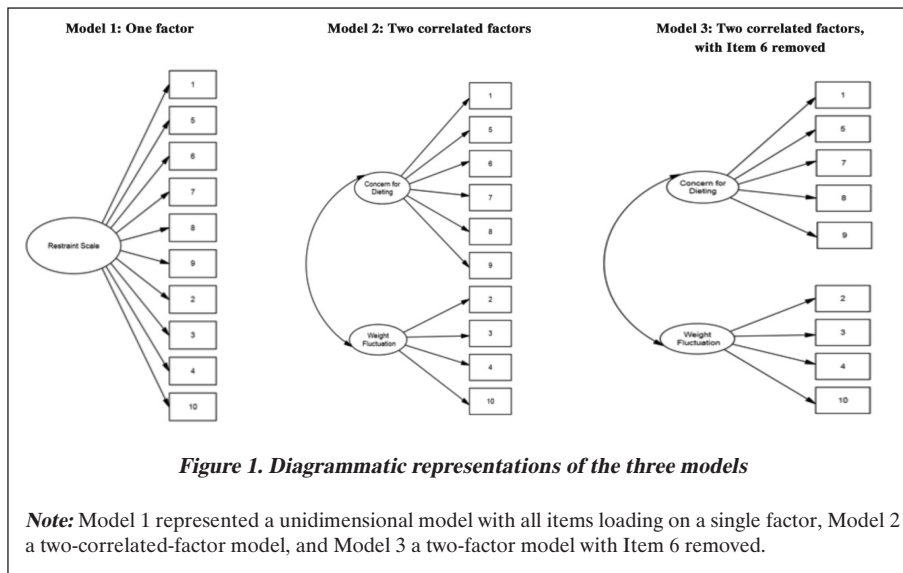
Eating Attitudes Test

The Eating Attitudes Test (EAT-26; Garner, Olmsted, Bohr, & Garnfinkel, 1982) assesses attitudes, feelings, and behaviours related to eating disorders (Garner et al., 1982). It consists of 26 items and three subscales: 1) Dieting, 2) Bulimia and Food Preoccupation, and 3) Oral Control. Some examples of the questions are: "I am terrified about being overweight" and "I avoid eating when I am hungry". The items are scored on a six-point Likert-type scale, ranging from 1 = Always to 6 = Never. A score of 20 is used to identify disordered eating. The validation of EAT-26 in Greek speaking female university students showed good internal consistency (Cronbach's alpha = .87; Argyrides & Kkeli, 2015). Cronbach's alpha of the total EAT-26 in the current study was .93, and .91 for the Dieting subscale.

Perceived Stress Scale

The Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988) is a 10-item questionnaire designed to measure an individual's appraisal of how stressful situations in their life are. The items ask about people's feelings and thoughts during the last month and are scored on a five-point Likert-type scale ranging from 0 = Never to 4 = Very Often. The questionnaire includes questions such as: "In the last month, how often have you been upset because of something that happened unexpectedly?" The original validation of the PSS-10 showed good internal consistency (Cronbach's alpha = .78; Cohen & Williamson, 1988). In a Greek-speaking sample in Cyprus, Michaelides, Christodoulou, Kkeli, Karekla, and Panayiotou (2016) found a high reliability of .85 and examined a bifactor model with evidence supporting an essentially unidimensional structure. Cronbach's alpha of the PSS-10 in the current study was .69.

Statistical analysis

First, descriptive statistics were calculated for the 10 items of the RS. A series of confirmatory factor analysis (CFA) models were performed in AMOS 19 (Figure 1). Model 1 represented a unidimensional model with all 10 items loading on a single factor. Model 2 was a two-correlated-factor model with the CD factor consisting of items 1, 5, 6, 7, 8, and 9, and WF factor consisting of items 2, 3, 4, and 10 (Herman & Polivy, 1980). Model 3 was a two-factor model with item six removed because it refers to two separate behaviours (eating in the presence of others and binging while alone) and has been removed from the analysis in other studies (Carvalho et al., 2016; van Strien et al., 2002). Model fit was evaluated with the χ^2 statistic, the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), the 90% confidence interval of RMSEA, and the Tucker-Lewis Index (TLI). Construct validity was then assessed, by adding other constructs as correlated observed variables to the RS latent factors.

Figure 1. *Diagrammatic representations of the three models*

Note: Model 1 represented a unidimensional model with all items loading on a single factor, Model 2 a two-correlated-factor model, and Model 3 a two-factor model with Item 6 removed.

RESULTS

Table 1 presents descriptive statistics for the 10 items of the Restraint Scale. Items 2, 3, and 4 of the WF subscale had the lowest means. The items of CD subscale had similar means and there was similar variability across items. Analysis of the item distributions suggested positive skewness of all items. Inter-item and item-total

correlations are also shown in Table 1. All items had positive, significant correlation coefficients with the total scale score. Item-total correlations were medium to high (.37 – .72), with Item 6 having the lowest coefficient.

Internal Consistency of the RS

The internal consistency of the 10 items of the RS was analysed by means of Cronbach's alpha coefficient; at .71, the internal consistency of the scale was acceptable. The four items of WF had positive, medium-size, significant inter-item correlations (.34 - .45) and an alpha coefficient of .72. The six items of CD had low to medium correlations (-.02 - .39) and an alpha coefficient of .62. The alpha coefficient for the CD subscale after the removal of Item 6 was .63.

Table 1. Item descriptive statistics, inter-item correlations and correlations with the total score

Item	Mean	SD	Skewness (S.E.)	1	2	3	4	5	6	7	8	9	10
1	0.921	1.039	0.806 (0.197)	-									
2	0.596	0.750	1.108 (0.197)	.31**	-								
3	0.604	0.907	1.698 (0.199)	.19*	**.37****	-							
4	0.375	0.635	1.642 (0.202)	.20*	**.40****	**.40****	-						
5	0.878	1.118	0.953 (0.199)	.19*	-.04	-.08	-.01	-					
6	0.731	0.892	0.975 (0.201)	.02	.07	-.02	.31**	.06	-				
7	0.867	0.960	0.732 (0.198)	.08	.05	.03	.13	.28**	.39**	-			
8	0.827	0.936	0.895 (0.197)	.38**	.23**	.35**	.18*	.36**	.23*	.24**	-		
9	1.157	1.012	0.485 (0.200)	.26**	.18*	.10	.03	.26**	-.02	.10	.37**	-	
10	1.000	1.003	0.997 (0.201)	.32**	**.45****	**.42****	**.34****	.14	.00	.10	.38**	.19*	-
Total score	7.900	4.843	0.739 (0.196)	.58**	.53**	.50**	.50**	.46**	.37**	.47**	.72**	.50**	.63**

Note: *$p < .05$, **$p < .001$. Correlations between items of WF are in bold.

Factorial structure

Fit indices of the CFA models are presented in Table 2. Model 1 had unacceptable fit indices. Results for Model 2 were improved, $\Delta\chi^2 = 40.40$, $\Delta df = 1$, $p < .001$, but the fit was still unacceptable. Model 3 had a significantly improved fit compared to Model 2, $\Delta\chi^2 = 44.23$, $\Delta df = 8$, $p < .001$, and, with the exception of TLI, had acceptable fit indices. All item loadings were significant, and their standardized values ranged from .29 to .82. The correlation between CD and WF was .58 ($p < .001$).

Table 2. CFA fit indices for each model

	χ^2	df	p	CFI	TLI	RMSEA	90% RMSEA C. I.
1. One factor	127.23	35	.00	.63	.42	.13	.11 - .16
2. Two correlated factors	86.83	34	.00	.79	.66	.10	.08 - .13
3. Two correlated factors, with Item 6 removed	42.60	26	.02	.92	.86	.07	.03 - .10

Note: df = degrees of freedom; *p* = probability level; *CFI* = Comparative Fit Index; *TLI* = Tucker-Lewis Index; *RMSEA* = Root Mean Square Error of Approximation; C.I. = Confidence Interval.

Correlations of RS factors with other measures

In a new model, potential correlates were added to the two RS latent factors. As shown in Table 3, the correlations of the CD factor with dieting and dieting behaviour were strong, providing evidence of convergent validity. The correlations of the CD factor with sex and depression were moderate. Females and those with higher scores on the depression scale had higher scores on the CD subscale. No significant correlations were found between CD and weight, exercise and perceived stress. The correlation of the WF factor with weight was moderate, providing evidence of convergent validity. Moreover, the correlations of the WF with dieting and dieting behaviour were moderate; more weight fluctuation is associated with dieting and dieting behaviour. No significant correlations were found with perceived stress, exercise, depression and sex. Evidence of discriminant validity was also found with the lack of significant correlations between the CD and WF subscales with measures of exercising and perceived stress.

The test of the difference between two dependent correlations showed that the CD and WF subscales had significantly different correlations with dieting, $Z = 3.94$, $p < .001$, and dieting behaviour, $Z = 6.79$, $p < .001$, with stronger coefficients for CD. Correlations with sex were also significantly different for CD and WF, $Z = 6.60$, $p < .001$, while WF was more strongly correlated with weight than CD, $Z = 5.81$, $p < .001$. These findings provide evidence that the two subscales should be considered as distinct based on differences in their correlations with other scales.

In addition, sex correlated significantly with weight, $r = -.64$, $p < .001$, depression correlated significantly with perceived stress, $r = .40$, $p < .001$, and dieting behaviour, $r = .34$, $p < .05$, and dieting behaviour with dieting, $r = .33$, $p < .001$, and sex, $r = .20$, $p < .05$.

Table 3. Correlation coefficients of RS factors with external variables

Measures	CD	WF	Sex	Weight	Dieting	Exercise	PSS	BDI
WF	.58**	-						
Sex	.36**	-.11	-					
Weight	.07	.47**	-.64**	-				
Dieting	.62**	.38**	.10	.14	-			
Exercise	-.02	.10	-.15	.15	.04	-		
PSS	.16	.07	.01	.01	-.06	-.12	-	
BDI	.29*	.16	.03	.12	-.03	.04	.40**	-
EAT-Dieting	.71**	.32*	.20*	.04	.33**	.01	.16	.34*

Note: CD: concern for dieting, WF: weight fluctuation, Sex: 0 = Male; 1= Female, PSS: perceived stress, BDI: depression, EAT-Dieting: dieting behaviour.
**$p < .001$, *$p < .05$

A multivariate analysis of variance was conducted with the BMI categories as the independent variable and the two RS subscales as dependent variables. Using Pillai's trace, there was a significant effect of BMI categories on the CD and WF subscales of the RS, $V = 0.20$, $F(6, 260) = 4.89$, $p < .001$, $\eta_p^2 = .10$. Univariate ANOVAs revealed significant effects on CD, $F(3, 130) = 3.55$, $p = .016$, $\eta_p^2 = .08$ and WF subscales, $F(3, 130) = 9.08$, $p < .001$, $\eta_p^2 = .17$. Tukey's post hoc comparisons revealed that underweight participants ($M = 3.64$, $SD = 2.68$) scored significantly lower on CD than overweight participants ($M = 6.73$, $SD = 2.89$). Underweight participants ($M = 1.04$, $SD = 1.37$) scored significantly lower on WF than all other categories ($M = 2.41$, $SD = 2.27$ for normal weight participants, $M = 3.99$, $SD = 2.95$ for overweight participants, $M = 5.40$, $SD = 1.67$ for obese participants). As a caution, we note that there were only five participants in the obese BMI category.

DISCUSSION

The Restraint Scale was designed to identify chronic dieters who display periods of restraint or dieting and episodes of overeating. The present study examined the factorial structure and the construct validity of the Greek adaptation of the RS.

Consistent with previous evidence (Carvalho et al., 2016; van Strien et al., 2002), the results of the study supported the existence of a two-factor model, instead of a unidimensional model. In line with van Strien et al. (2002), the two-factor structure of the RS with Item 6 removed had better fit than the unidimensional and the two-factor model. Item 6 appears to be problematic due to its double meaning. It refers

to two separate behaviours: eating in the presence of others and binging while alone. In a future version of the RS, Item 6 could be considered for revision or removal, since it is singled out in multiple studies across languages (Carvalho et al., 2016; van Strien et al., 2002).

The correlation between the CD and WF subscales was quite strong, suggesting that they are statistically and conceptually related, but they measure different aspects of the same construct. Restraint involves both a tendency to restrict food intake, as well as a tendency to splurge (Heatherton et al., 1988). The restraint theory associated with the RS provides explanation for the two behaviours, restriction of food intake and splurge, often seen in individuals with binge eating disorder.

The two subscales were found to correlate differentially with other measures. The CD subscale was more strongly correlated with dieting and dieting behaviour, evidence of convergent validity, and moderately correlated with sex and depression. The WF subscale had lower correlations with dieting, and dieting behaviour. Unlike CD, WF had a moderate positive association with weight as anticipated, providing support for convergent validity. These findings are similar with previous studies (Mak & Lai, 2012; van Strien et al., 2007) and suggest that the two subscales have differential networks of associations. Evidence of discriminant validity was also found with the lack of significant correlations between the RS subscales with measures of exercising and perceived stress. Our findings suggest the consideration of two different subscores, one for the CD subscale and one for the WF subscale, instead of a single total score.

There were significant differences of the BMI categories on the subscales of RS, particularly when underweight participants were compared to the higher BMI categories. Higher scores on the WF subscale are observed with higher BMI categories (van Strien, Herman, & Verheijden, 2014). It is reasonable that the greater one's weight status is, the greater the weight fluctuation will be if the person is interested in dieting (Heatherton et al., 1988). In addition, the greater one's body weight is, engagement in dieting is more likely (van Strien et al., 2014).

The investigation was focused on the factorial structure and the construct validity of the Greek RS in a Cypriot student sample. Results may be limited due to the student composition of the sample, and the sample size particularly for some of the four BMI categories. More differences between the BMI categories could have been detected with more participants. The moderate internal consistency of the RS and its subscales may also represent another limitation. Future research should investigate the factorial structure of the RS in other populations and languages.

In conclusion, the findings showed that the Greek version of the RS has good psychometric properties and can be used as a research instrument if the concern of the research is to identify dieters who restrict their caloric intake as well as they splurge.

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