



## Research article

## Body-related shame or guilt? Dominant factors in maladaptive eating behaviors among Hungarian and Norwegian university students

Gabriella Vizin<sup>a,c,\*</sup>, Zsolt Horváth<sup>a,b</sup>, Tünde Vankó<sup>d</sup>, Róbert Urbán<sup>a</sup><sup>a</sup> Eötvös Loránd University, Institute of Psychology, 1064 Budapest, Izabella utca 46, Hungary<sup>b</sup> Eötvös Loránd University, Doctoral School of Psychology, 1064 Budapest, Izabella utca 46, Hungary<sup>c</sup> Semmelweis University, Faculty of General Medicine, Department of Clinical Psychology, 1095 Budapest, Üllői út 25, Hungary<sup>d</sup> Mayfairtherapy Practice, 53 Davies Str, London, W1K 5JH, UK

## HIGHLIGHTS

- The two-factor model of WEB-SG was confirmed in Hungary and Norway.
- WEB-guilt is associated with dieting as a restrictive eating attitude.
- WEB-shame is associated with higher BMI and chronic body shame.
- WEB-guilt and WEB-shame may be two important factors in eating disorders.

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## ABSTRACT

The main purpose of our study was to examine the psychometric properties of Conrads' Weight- and Body-Related Shame and Guilt Scale (WEB-SG) and associations of body shame and guilt with maladaptive eating behaviors and general chronic shame among Hungarian and Norwegian university students. Therefore, we collected data from 561 university students from both nations in a cross-sectional questionnaire study. Participants completed the following standardized self-report questionnaires in this online survey: WEB-SG, Eating Attitude Test-26 (EAT-26) and Experience of Shame Scale (ESS). We tested the measurement model of the WEB-SG with confirmatory factor analysis (CFA), and we performed CFA with covariates analysis to examine the association between WEB-guilt (WEB-G) and WEB-shame (WEB-S) and predictors. Our empirical model of WEB-SG has adequate fit with Conrads' theoretical model among both samples. The body-related guilt positively associated with dieting and negatively related to oral control in both groups. We found a significant positive relationship between WEB-S and BMI in Hungarian sample. According to our results, WEB-SG is an adequate questionnaire for assessing weight and body-related shame and guilt in Hungarian and Norwegian non-clinical samples. Maladaptive weight and body-related guilt could be a relevant factor in proneness to anorexia. Our results highlight WEB-G and WEB-S as two critical factors in the assessment and treatment of eating difficulties.

## 1. Introduction

Eating disorders (EDs) and maladaptive eating behaviors have harmful consequences not only on mental functioning (Ulfvebrand et al., 2015) but also on body weight and shape and somatic functioning (Keski-Rahkonen and Mustelin, 2016). Lifetime prevalence of EDs (such as anorexia nervosa, bulimia nervosa and binge eating disorder) is relatively high, around 1%–4% among women and 0.3%–0.7% among men (Keski-Rahkonen and Mustelin, 2016). A higher proportion of young

women (8%–17%) suffer from milder forms of EDs (Lazarević et al., 2016), and people with subthreshold forms of eating disorders show a risk for developing subsequent clinical forms of EDs (Patton et al., 1999). The median age of onset for eating disorders overlaps with undergraduate years (e. g. Volpe et al., 2016), thus university students are considered a high-risk group for showing symptoms of EDs (Lazarević et al., 2016).

Several previous theories and study results have demonstrated association of negative emotions and emotion-dysregulation with

\* Corresponding author.

E-mail address: [vizin.gabriella@ppk.elte.hu](mailto:vizin.gabriella@ppk.elte.hu) (G. Vizin).<https://doi.org/10.1016/j.heliyon.2022.e08817>

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maladaptive eating behaviors (e.g., Goss and Gilbert, 2002; Henderson et al., 2019; Kelly and Tasca, 2016; Macht, 2008; Mallorquí-Bagué et al., 2018; Prefit et al., 2019; Swan and Andrews, 2003).

Focusing on negative self-conscious emotions, such as shame (which involves feelings of defectiveness, inferiority and powerlessness) and guilt (it focuses on evaluating specific behaviors that elicit corrective action) (Tangney and Tracy, 2012), recently researchers have evidenced the essential role of general shame in ED symptomatology (Duarte et al., 2016) and some research results have suggested that general shame is a more important factor in explaining EDs than general guilt (Kelly and Tasca, 2016; Levinson et al., 2016).

Goss and Gilbert (2002) highlighted the importance of emotion dysregulation in self-conscious emotions in eating disturbances. According to Goss and Gilbert's model (2002) persons who have higher level of general shame and who feel vulnerable in a negative, evaluative social situation try to defend themselves against perceived or real social threats by developing a perceived ideal body shape (Goss and Gilbert, 2002; Goss and Allan, 2009). Instead of experiencing painful general shame, they control their body weight or shape, and they feel pride if they can manage it and shame if they cannot. This is the *pride-shame* spiral which can maintain restrictive eating disorders, such as anorexia nervosa (AN). In contrast, persons with bulimic symptoms are ashamed of inner deficiencies of emotional control and they are afraid that these deficits might be exposed or judged by others. As explained by Goss and Gilbert (2002) overeating and bulimia nervosa (BN) include *shame-shame* spirals. However, the structural model of self-conscious emotions (Lewis, 1992) and the process model of self-conscious emotions (Tracy and Robins, 2004) may suggest the importance of *guilt* in this process of emotion dysregulation. According to these models, if one focuses on a concrete and controllable behavior instead of a stable, global worthlessness (such as shame), one may experience pride in the case of success and guilt in the case of failure. In case of eating difficulties, the main purpose of this specific and controllable behavior (e.g., starvation and dieting) is to regulate emotions, and successful regulation is associated with pride, whereas unsuccessful regulation can lead to feelings of guilt and engagement in maladaptive restrictive behaviors. Based on these models (Goss and Gilbert, 2002; Lewis, 1992; Tracy and Robins, 2004), general shame in regard to ED's appears when the person focuses on the external evaluative social environment (in AN), or the person focuses on the inner deficiencies of emotion regulation (in BN). However, the role of guilt in the emotion dysregulation process is not entirely clear.

In addition to general shame and guilt, several studies have highlighted particularly the role of body image and body shame (feeling ashamed because of your body or a specific body part) in EDs, instead of general guilt or general shame or other aspects of shame, such as characterological (feeling ashamed because of who/what kind of a person you are) or behavioral (feeling ashamed for doing something wrong) (Andrews et al., 2002). Previous studies found that women with EDs had a higher level of body shame than women in the control group (Swan and Andrews, 2003). In addition, body shame had a mediating role between body dissatisfaction and disordered eating behaviors among adolescent girls (Mustapic et al., 2015), and body shame was also associated with eating disturbance both in the community sample (Burney and Irwin, 2000), and in the clinical population with EDs (Doran and Lewis, 2012). Furthermore, Mendia et al. (2021) found that higher levels of body shame and body guilt increase the risk of developing eating disturbances in a non-clinical sample. However, another study associated body shame specifically with anorexic (but not bulimic) symptoms (Troop and Redshaw, 2012) and with binge eating symptoms (Duarte et al., 2014).

It seems, body-related self-conscious emotions, such as body-specific shame and guilt may play significant roles in EDs' psychopathology, thus measuring of body-specific shame and guilt is necessary for identification of EDs, but tests have shown some limitations (Conradt et al., 2007). Two of them—the Experience of Shame Scale (ESS; Andrews et al., 2002) and the Objectified Body Consciousness Scale (McKinley and Hyde, 1996)—measure only body-related shame. Additionally, as Conradt et al. (2007)

highlighted, some other measurements evaluate only eating-related shame and guilt (e.g., the Shame and Guilt Eating Scale; Frank, 1991) or utilize unreasonably long questionnaires (e.g., the Body Image Guilt and Shame Scale; Thompson et al., 2003).

To address the need for a suitable measurement of weight- and body-related shame and guilt, Conradt et al. (2007) developed the 12-item Weight- and Body-Related Shame and Guilt Scale (WEB-SG). The WEB-SG is a brief and easy-to-administer self-report measure that assesses the occurrence of shame and guilt as they pertain to weight control. It contains two factors: weight- and body-related shame (WEB-S, which is triggered by imagined or real others) and weight- and body-related guilt (WEB-G, which is related to eating habits, exercising, and weight control). Although data in the existing literature has suggested that the WEB-SG is a reliable measurement tool (e. g. Albohn-Kühne and Rief, 2011; Conradt et al., 2007; Conradt et al., 2008; Craven and Fekete, 2019), the results are ambiguous. Conradt et al. (2007) found in their original study a mildly significant, positive correlation between body mass index (BMI) and WEB-S, but not with WEB-G, among a non-clinical sample of obese people. In a sample of undergraduate women, Craven and Fekete (2019) found, that WEB-S and WEB-G are related to increased binge eating syndrome. However, Albohn-Kühne and Rief (2011) found that obese people with BED had higher scores in WEB-G, but scores in WEB-S were not higher.

More information regarding validity of the scale in non-obese participants is needed. In addition, there are no data examining the psychometric properties of the WEB-SG cross-culturally order to provide further details regarding the validity of the scale. We have knowledge of impact of gender (binary), age, and ethnicity on general shame and guilt (e. g. Else-Quest et al., 2012; Orth et al., 2010), and previous studies evidenced that body dissatisfaction is a cross-cultural phenomenon (e. g. Wardle et al., 2006), but researchers have not assessed the difference between general or weight- and body-related shame and guilt in Central-Eastern and North-Western European countries.

Based on the previous assumptions, the first aim of this study was to examine WEB-SG's psychometric properties. Specifically, our objective was to assess and compare its factor structure and item performance among university students from Hungary and Norway. Our second aim was to identify the associates of the WEB-S and WEB-G, such as sex, age, level of education, health status, BMI, and ED characteristics, and the different aspects of shame. Supporting the construct validity of WEB-SG, we assumed that restrictive eating attitudes (such as dieting and oral control) would be more closely associated with weight- and body-related guilt and binge eating and purging related attitude (such as bulimia) would be related to weight- and body-related shame. In addition, we expected that body shame would be associated with weight- and body-related shame but not weight- and body-related guilt.

## 2. Methods

### 2.1. Participants and procedure

We collected data from 652 university students in Hungary ( $n = 430$ ; 65.95%) and Norway ( $n = 222$ ; 34.05%) in a cross-sectional online study using a set of standardized questionnaires. Hungarian participants used a Hungarian version of the questionnaires, and Norwegian subjects used English versions. In the Norwegian sample, the inclusion criterion was to speak fluent English. However, participants reporting existing chronic mental or physical disorders were excluded from subsequent analyses ( $n = 91$ ). Thus, the final sample included data from 561 university students: 405 Hungarian (72.19%) and 156 Norwegian (23.92%). Participants were between the ages of 18 and 30 ( $M = 22.30$  [ $SD = 2.77$ ]) in the final sample, and 81.11% ( $N = 455$ ) of these respondents were women. Data was collected by psychology undergraduates, and the online questionnaire was sent to different university websites and social media pages in Hungary and Norway. We obtained informed consent from the participants, and the Research Ethics Committee of the Faculty of Education and

Psychology of the Eötvös Loránd University approved the study protocol (2017/31 and 2018/35). This study was performed according to the ethical principles of the Declaration of Helsinki.

## 2.2. Measures

Descriptive data were collected through a demographic questionnaire, which consisted of questions about age, sex (assigned female at birth = AFAB, and assigned male at birth = AMAB), marital status, height, weight, education level, nationality, and previous and existing physical and psychological illnesses. BMI was calculated for each participant based on their self-reported height and weight data.

The Weight- and Body-Related Shame and Guilt Scale (WEB-SG, [Conradt et al., 2007](#)) consists of 12 items measuring two factors: WEB-S (e.g., “When I am in a situation where others can see my body, I feel ashamed”) and WEB-G (e.g., “When I have eaten more than I want, I experience feelings of guilt”). Each item is rated on a 5-point scale from 0 (*never*) to 4 (*always*). The English version of the WEB-SG was translated to Hungarian by two researchers (one of them was the first author), then an independent researcher translated back to English. During the translation process, we followed the steps of Beaton’s protocol ([Beaton et al., 2000](#)).

The Eating Attitudes Test (EAT) was developed as a self-report measure of the symptoms of EDs ([Garner and Garfinkel, 1979](#)). In this study, we used the modified, 26-item version of the EAT, which is intended to measure symptoms and attitudes of eating habits ([Garner et al., 1982](#); Hungarian version: [Túry et al., 1990](#)). Each item on this version of the EAT is rated on a 6-point scale to assess the frequency of eating behaviors, from 1 (*always*) to 6 (*never*). The EAT has three factors: dieting (e.g., “Eat diet foods”), bulimia and food preoccupation (e.g., “Have gone on eating binges where I feel that I may not be able to stop”), and oral control (e.g., “Cut my food into small pieces”). From acceptable to excellent degrees of internal consistency was demonstrated for the subscales in our sample (Cronbach’s  $\alpha$ : 0.63–0.93).

The Experience of Shame Scale (ESS) was developed to measure three domains of shame: body shame (e.g., “Have you ever felt ashamed because of your body or a specific body part?”), characterological shame (e.g., “Have you ever felt ashamed because of your own habits?”), and behavioral shame (e.g., “Have you ever felt ashamed for doing something wrong?”) ([Andrews et al., 2002](#)). The scale consists of 25 items rated on a 4-point scale from 1 (*not at all*) to 4 (*very much*). Based on the validation study of the Hungarian version of this questionnaire, ESS is a valid and reliable scale of chronic shame in Hungarian clinical and healthy samples ([Vizin et al., 2016](#)). Satisfactory levels of internal reliability were presented for the ESS subscales in our sample (Cronbach’s  $\alpha$ : 0.85–0.92).

## 2.3. Statistical analysis

As a preliminary analysis, Hungarian and Norwegian participants were compared in terms of sociodemographics, weight and health status, eating attitude, shame-related variables as well as in terms of WEB-S and WEB-G. For continuous dependent variables independent sample t-tests were performed to compare the groups, and Cohen’s  $d$  values represent the effect size. For categorical variables Chi square statistics ( $\chi^2$ ) were used and Phi values ( $\phi$ ) indicate the effect size.

We performed a series of confirmatory factor analyses to assess the degree of model fit of the original measurement model of the WEB-SG with the current data sets. Items on the questionnaire were defined as continuous indicators. A maximum likelihood robust to non-normality estimation method was applied for all analyses. First, the hypothesized two-factor structure was estimated separately in the Hungarian and Norwegian subsamples. Based on the modification indices, error covariance between indicators of the scale was taken into account and allowed if the content of the items reinforced it. The level of model fit was evaluated with various fit measures. A satisfactory level of model fit was determined if the value of the comparative fit index (CFI) and Tucker-

Lewis fit index (TLI) exceeded 0.950, and if the index of the root-mean-square error approximation (RMSEA) and standardized root-mean-square residual (SRMR) was below 0.080. Cronbach’s  $\alpha$  values were calculated to assess the internal consistency of the WEB-SG factors.

Next, we conducted a multiple-group confirmatory factor analysis to test measurement invariance between the Hungarian and Norwegian participants. Three levels of measurement invariance were specified. The configural invariance model freely estimated the measurement model in the two groups. In the case of metric invariance, the factor loadings were fixed as equal between Hungarian and Norwegian individuals. Finally, the scalar invariance hypothesis required equal factor loadings, and the intercepts were fixed as equal between the two groups. Each of the models was assessed according to the previously mentioned criteria. Based on a simulation study by [Chen \(2007\)](#), each level of invariance between the groups was supported if the change in the value of the CFI, RMSEA, and SRMR did not exceed the threshold of 0.010, 0.015, and 0.010, respectively, compared to the previous measurement invariance model. Chi-square difference tests were computed by using the DIFFTEST option in Mplus.

Finally, a multiple group multiple indicator multiple causes (MIMIC) model was analyzed to explore the relationship between latent factors separately for the Hungarian and Norwegian participants. The latent factors of WEB-S and WEB-G were specified as outcome variables, and sociodemographics, weight and health status, eating attitude, and shame-related variables were predictor variables. Covariates were defined as observed variables. The EAT measured subscales of eating disorder symptoms, and dimensions of shame were represented by the ESS. A series of Wald tests were performed to compare the strength of association between each covariate and latent factor in both groups. Pairwise correlations between the predictor and outcome variables were also computed.

All analyses were performed with IBM SPSS Statistics 25.0 and Mplus 8.0 ([Muthén and Muthén, 2017](#)) statistical software.

## 3. Results

### 3.1. Descriptive statistics

Descriptive statistics and a comparison between the Hungarian and Norwegian respondents are presented in [Table 1](#). The mean age of the Hungarian sample was significantly lower than that of the Norwegian sample. Individuals from Hungary showed a significantly higher level of WEB-S and oral control with a small effect size. A significantly higher proportion of Norwegian participants reported chronic physical or mental disorders in the past and university or college graduation.

### 3.2. Confirmatory factor analysis

Model fit indices of the measurement models for the two factors are summarized in [Table 2](#). The general two-factor model showed a suboptimal degree of model fit among Norwegian participants and close-to-acceptable rates of model fit among Hungarian participants for the values of RMSEA, CFI, TLI, and SRMR (Model 1). Based on the results of the modification indices, error covariances between Item 1 (“When I have eaten more than I want, I experience feelings of guilt”) and Item 3 (“When I eat fattening food (e.g., tarts), I get distressed by the feeling that I did something wrong”) and between Item 7 (“I am ashamed of myself when others get to know how much I really weigh”) and Item 12 (“Because the size of my clothes is embarrassing for me, I would rather avoid shopping for new clothes”) were allowed in both subsamples (Model 2). Thus, for the modified two-factor measurement model, a satisfactory level of model fit was presented separately for the Hungarian and Norwegian respondents, according to the index of RMSEA, CFI, TLI, and SRMR. This model was retained for further analyses.

The standardized factor loadings of the two-factor model with error covariances for the Hungarian and Norwegian participants are displayed

**Table 1.** Descriptive statistics and comparisons between Hungarian and Norwegian participants.

	Hungarian participants n = 405	Norwegian participants n = 156	Test statistic (p)	Effect size
Age Mean (SD)	21.60 (2.42)	24.12 (2.81)	t = 9.88 (p < 0.001)	d = 0.99
Sex: Female N (%)	328 (81.0%)	127 (81.9%)	$\chi^2 = 0.07$ (p = 0.797)	$\phi = 0.01$
Level of education: Graduation at university or college N (%)	94 (23.2%)	88 (56.4%)	$\chi^2 = 56.34$ (p < 0.001)	$\phi = 0.32$
Body mass index Mean (SD)	22.38 (3.84)	22.93 (3.25)	t = 1.58 (p = 0.114)	d = 0.15
History of chronic physical or mental disorder N (%)	20 (4.9%)	37 (23.7%)	$\chi^2 = 43.51$ (p < 0.001)	$\phi = 0.28$
Weight- and body-related guilt Mean (SD)	9.25 (7.01)	9.12 (6.41)	t = 0.22 (p = 0.823)	d = 0.02
Weight- and body-related shame Mean (SD)	8.00 (6.34)	6.19 (5.90)	t = 3.09 (p = 0.002)	d = 0.29
Dieting Mean (SD)	6.93 (7.56)	5.60 (7.73)	t = 1.86 (p = 0.064)	d = 0.18
Bulimia & food preoccupation Mean (SD)	1.22 (2.28)	1.37 (3.36)	t = 0.59 (p = 0.556)	d = 0.06
Oral control Mean (SD)	2.90 (3.02)	1.74 (3.47)	t = 3.89 (p < 0.001)	d = 0.37
Behavioral shame Mean (SD)	21.54 (6.40)	20.42 (5.91)	t = 1.91 (p = 0.057)	d = 0.18
Bodily shame Mean (SD)	9.67 (3.52)	9.15 (3.65)	t = 1.57 (p = 0.116)	d = 0.15
Characterological shame Mean (SD)	25.06 (7.89)	23.83 (8.07)	t = 1.65 (p = 0.099)	d = 0.16

Note. For continuous dependent variables independent sample t-tests were performed to compare the groups, and Cohen's d values represent the effect size. For categorical variables Chi square statistics ( $\chi^2$ ) were used and Phi values ( $\phi$ ) indicate the effect size. Test statistic and effect size values presented with absolute values. SD: Standard deviation.

in Figure 1. All factor loadings were significant to at least the  $p < 0.001$  level. Each of the items demonstrated a positive and moderately strong ( $\lambda = 0.55\text{--}0.91$ ) association with the related latent factor. A high correlation was presented between the latent factors of WEB-S and WEB-G ( $r = 0.76\text{--}0.79$ ). However, these levels of the inter-factor correlation were considered as acceptable due to the similarities between the constructs of WEB-S and WEB-G. The subscales of the WEB-SG were characterized by a sufficient degree of internal consistency in the Hungarian (WEB-S:  $\alpha = 0.87$ ; WEB-G:  $\alpha = 0.92$ ) and Norwegian group as well (WEB-S:  $\alpha = 0.91$ ; WEB-G:  $\alpha = 0.91$ ).

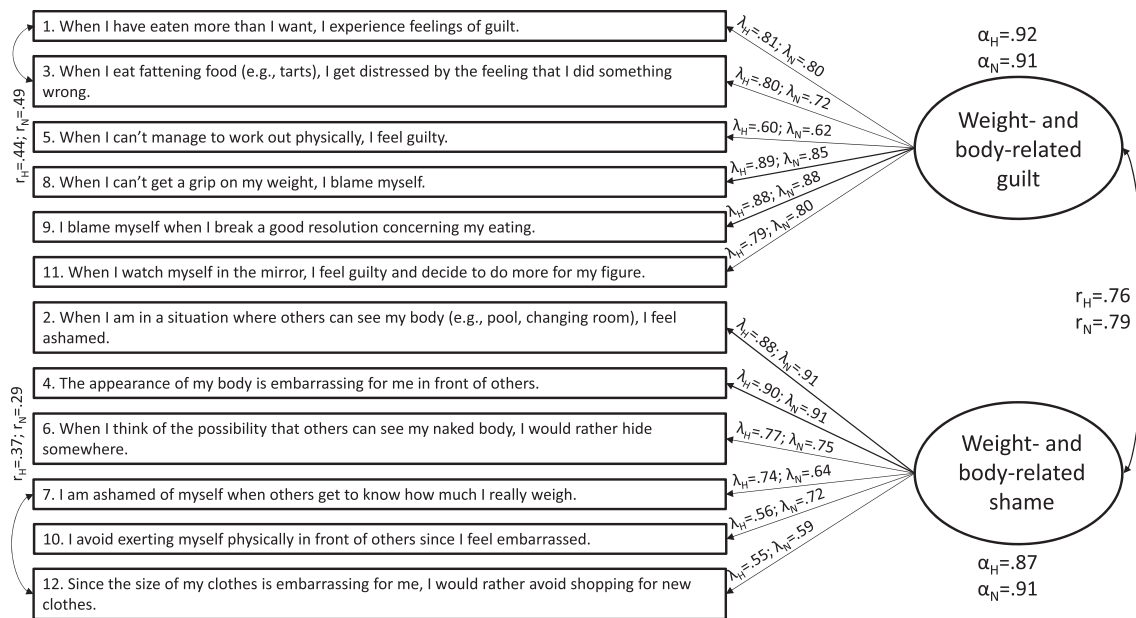
### 3.3. Measurement invariance testing

The model fit measures of the different invariance models are presented in Table 2. The configural, metric, and scalar invariance models showed sufficient rates of model fit. As displayed in Table 2, a comparison of the configural and metric models did not reveal a significant decrease for the metric invariance model in the level of model fit based on the chi-square difference test. Similarly, changes in the RMSEA and CFI values also confirmed the metric invariance of the two-factor structure between the two groups. However, in a comparison of the metric and

**Table 2.** Model fit and invariance testing of the measurement models.

	$\chi^2$	df	RMSEA (Cfit)	CFI	TLI	SRMR
<i>Measurement models – Hungarian sample (n = 405)</i>						
Model 1: Two-factor model	242.53***	53	0.094 (p < 0.001)	0.929	0.912	0.054
Model 2: Two factor model, allowing for error covariance	144.05***	51	0.067 (p = 0.015)	0.965	0.955	0.052
<i>Measurement models – Norwegian sample (n = 156)</i>						
Model 1: Two-factor model	144.38***	53	0.105 (p < 0.001)	0.905	0.882	0.061
Model 2: Two factor model, allowing for error covariance	110.12***	51	0.086 (p = 0.005)	0.939	0.920	0.061
<i>Measurement invariance testing (Model 2)</i>						
Configural invariance model	252.76***	102	0.073 (p = 0.001)	0.958	0.945	0.054
Metric invariance model	261.91***	112	0.069 (p = 0.002)	0.958	0.951	0.054
Scalar invariance model	326.43***	122	0.077 (p < 0.001)	0.943	0.938	0.063
<i>Model comparisons (Model 2)</i>						
	$\Delta\chi^2$	$\Delta df$	$\Delta RMSEA$	$\Delta CFI$	$\Delta TLI$	$\Delta SRMR$
Configural versus metric model	5.64 <sup>NS</sup>	10	+ 0.004	0.000	-0.006	0.000
Metric versus scalar model	73.94***	10	-0.008	-0.015	-0.013	-0.009

Note.  $\chi^2$  - Chi Square test statistics; RMSEA - Root Mean Squared Error of Approximation; Cfit - Closeness of fit test for RMSEA; CFI - Comparative Fit Index; TLI - Tucker-Lewis Index; SRMR - Standardized Root Mean Square Residual.  $\Delta\chi^2$  - Chi square difference test. Significant Chi Square tests or Chi square difference tests are indicated by: \*\*\*p < 0.001. Non-significant (p > 0.05) Chi Square tests or Chi square difference tests are indicated by NS in superscript. In each difference tests a value with positive sign indicate improvement of model fit, while a value with negative sign represent decrease of model fit.



**Figure 1.** Standardized factor loadings ( $\beta$ ) and correlations ( $r$ ) related to the two-factor model of the Weight- and Body-Related Shame and Guilt Scale (WEB-SG) among Hungarian and Norwegian participants (denoted with superscripts “H” and “N”, respectively). All factor loadings and correlations are significant at least  $p < 0.001$  level.

**Table 3.** Correlations of the study variables in the Hungarian sample (N = 403).

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. WEB-G <sup>1</sup>	*	<b>0.76</b>	-0.01	<b>0.32</b>	-0.03	<b>0.26</b>	0.05	<b>0.84</b>	<b>0.60</b>	-0.05	<b>0.30</b>	<b>0.60</b>	<b>0.27</b>
2. WEB-S <sup>1</sup>		*	-0.10	<b>0.27</b>	-0.14	<b>0.31</b>	0.09	<b>0.64</b>	<b>0.46</b>	0.03	<b>0.38</b>	<b>0.73</b>	<b>0.40</b>
3. Age			*	0.00	<b>0.62</b>	0.03	0.05	-0.03	-0.10	-0.12	-0.10	-0.05	-0.06
4. Sex <sup>2</sup>				*	0.00	-0.23	0.05	<b>0.26</b>	<b>0.15</b>	0.05	<b>0.19</b>	<b>0.26</b>	0.08
5. Level of education <sup>3</sup>					*	-0.04	0.01	-0.07	-0.10	-0.09	-0.13	-0.07	-0.10
6. Body mass index						*	<b>0.26</b>	<b>0.18</b>	-0.28	-0.04	<b>0.15</b>	0.00	0.07
7. History of chronic physical or mental disorder <sup>4</sup>							*	0.07	<b>0.12</b>	0.00	0.04	0.09	0.10
8. Dieting								*	<b>0.64</b>	0.08	<b>0.20</b>	<b>0.52</b>	<b>0.19</b>
9. Bulimia & food preoccupation									*	<b>0.21</b>	<b>0.22</b>	<b>0.39</b>	<b>0.24</b>
10. Oral control										*	<b>0.20</b>	0.09	<b>0.17</b>
11. ESS Behavioral shame											*	<b>0.46</b>	<b>0.74</b>
12. ESS Bodily shame												*	<b>0.48</b>
13. ESS Characterological shame													*

Note: Correlation coefficients presented with bold figures are significant at least  $p < 0.05$  level. <sup>1</sup> – specified as latent variables; <sup>2</sup> – Sex: coded as 0 = assigned male at birth (AMAB), 1 = assigned female at birth (AFAB); <sup>3</sup> - Level of education: coded as 0 = Participant did not graduated at university or college, 1 = Participant graduated at university or college; <sup>4</sup> – Previous chronic physical or mental disorder: coded as 0 = No, 1 = Yes. WEB-G: weight- and body-related guilt; WEB-S: weight- and body-related shame. ESS: Experience of Shame Scale.

scalar invariance models, the chi-square difference test and  $\Delta CFI$  indicated a significant decrease in model fit. The  $\Delta RMSEA$  and  $\Delta SRMR$  values did not exceed the defined threshold between the metric and scalar invariance models. Therefore, our hypothesis on the equality of intercepts was not supported unanimously.

### 3.4. MIMIC model

The correlations between the latent variables and the covariates are displayed in Tables 3 and 4, showing the Hungarian and Norwegian groups separately. WEB-S and WEB-G showed a significant positive association with female sex, BMI, dieting, and the behavioral, body, and characterological aspects of shame in both subsamples.

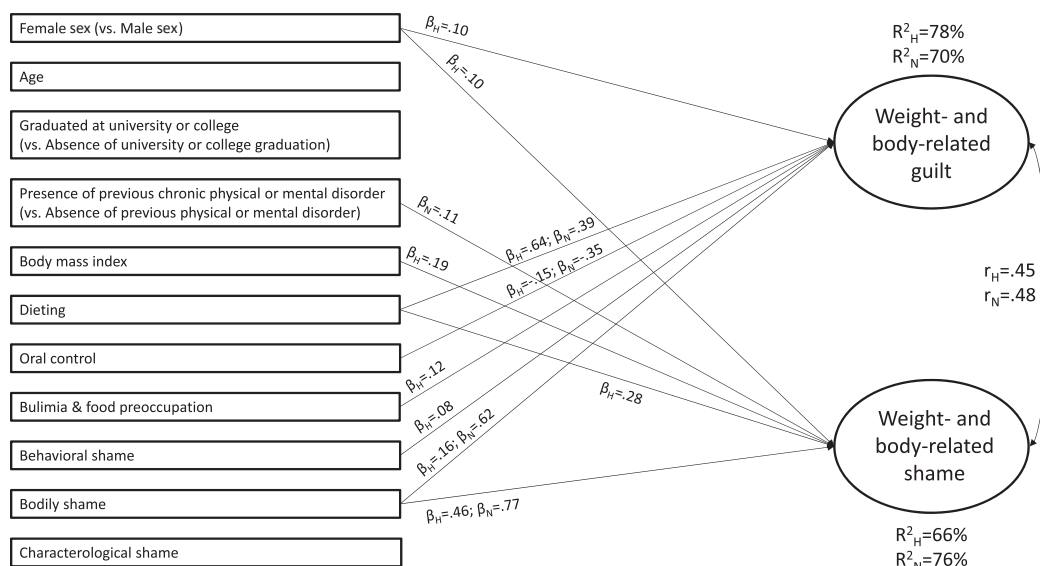
To examine the multivariate prediction of the sociodemographic, weight and health status, ED characteristics, and shame-related variables

on the latent factors of WEB-S and WEB-G, a multiple group MIMIC model was proposed (Hungarian sample:  $\chi^2(161) = 459.72; p < .001$ ;  $RMSEA = 0.068 [0.061-0.075]$ ;  $CFI = 0.920$ ;  $TLI = 0.902$ ;  $SRMR = 0.045$ ; Norwegian sample:  $\chi^2(161) = 276.67; p < .001$ ;  $RMSEA = 0.068 [0.054-0.081]$ ;  $CFI = 0.917$ ;  $TLI = 0.898$ ;  $SRMR = 0.049$ ). The standardized regression coefficients between the covariates and latent factors are displayed separately for each group in Figure 2 and Table 5. The predictor variables explained 66%–78% of the variance related to the latent variables. In the case of the Hungarian participants, a significantly higher level of WEB-G was predicted by female sex, higher rates of dieting, bulimia and food preoccupation, behavioral and body shame, and a lower level of oral control. Higher degrees of dieting and body shame and a lower level of oral control contributed significantly to the predictability of WEB-G among the individuals from Norway. Female sex, BMI, dieting, and body shame showed a significant and positive

**Table 4.** Correlations of the study variables in the Norwegian sample (N = 155).

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. WEB-G <sup>1</sup>	*												
2. WEB-S <sup>1</sup>	<b>0.81</b>	*											
3. Age	0.08	0.03	*										
4. Sex <sup>2</sup>	<b>0.25</b>	<b>0.16</b>	-0.02	*									
5. Level of education <sup>3</sup>	-0.03	-0.04	<b>0.60</b>	-0.01	*								
6. Body mass index	0.31	<b>0.37</b>	<b>0.18</b>	-0.05	0.00	*							
7. History of chronic physical or mental disorder <sup>4</sup>	0.12	<b>0.21</b>	0.14	0.03	0.10	-0.01	*						
8. Dieting	<b>0.45</b>	<b>0.32</b>	<b>0.17</b>	0.11	0.08	<b>0.19</b>	0.10	*					
9. Bulimia & food preoccupation	0.24	0.19	<b>0.16</b>	-0.02	0.11	0.20	0.06	<b>0.77</b>	*				
10. Oral control	-0.08	-0.06	0.09	-0.09	<b>0.13</b>	<b>-0.13</b>	-0.02	<b>0.62</b>	<b>0.67</b>	*			
11. ESS Behavioral shame	<b>0.30</b>	<b>0.43</b>	-0.06	0.06	-0.09	0.04	0.12	0.03	-0.04	-0.06	*		
12. ESS Bodily shame	<b>0.77</b>	<b>0.85</b>	0.08	<b>0.21</b>	-0.02	<b>0.31</b>	0.14	<b>0.34</b>	0.14	-0.04	<b>0.50</b>	*	
13. ESS Characterological shame	<b>0.36</b>	<b>0.48</b>	-0.04	-0.08	-0.08	0.12	0.08	0.14	0.07	0.05	<b>0.67</b>	<b>0.54</b>	*

Note: Correlation coefficients presented with bold figures are significant at least  $p < 0.05$  level. <sup>1</sup> – specified as latent variables; <sup>2</sup> – Sex: coded as 0 = assigned male at birth (AMAB), 1 = assigned female at birth (AFAB); <sup>3</sup> - Level of education: coded as 0 = Participant did not graduated at university or college, 1 = Participant graduated at university or college; <sup>4</sup> – Previous chronic physical or mental disorder: coded as 0 = No, 1 = Yes. WEB-G: weight- and body-related guilt; WEB-S: weight- and body-related shame. ESS: Experience of Shame Scale.



**Figure 2.** Significant association between latent factors of weight- and body-related Shame and Guilt and external covariates among Hungarian and Norwegian participants (denoted with superscripts “H” and “N”, respectively). Only significant ( $p < 0.05$ ) standardized regression coefficients ( $\beta$ ) and correlations ( $r$ ) are presented to ease interpretation. Presents all coefficients and results of the Wald-test for comparison between Hungarian and Norwegian participants.

association with WEB-S in the Hungarian group. In the case of the Norwegian respondents, the presence of previous chronic physical or mental disorders and elevated levels of body shame significantly predicted a higher degree of WEB-S.

Results of the Wald-test indicated that in both groups, dieting and oral control were more strongly associated with WEB-G, and body shame was more strongly related to WEB-S. In the Hungarian sample, bulimia and food preoccupation showed a stronger relationship with WEB-G, and BMI was more closely associated with WEB-S. Among the Norwegian participants, a history of previous chronic physical or mental disorders was associated more robustly with WEB-S (Table 5).

**4. Discussion**

We could support the original measurement model of WEB-SG (Conradt et al., 2007) in two independent – Hungarian and Norwegian

-samples. Thus, the WEB-SG has two independent factors, with six items loading on the WEB-G factor and the other six items loading on the WEB-S factor in the Hungarian and Norwegian subsamples. According to our results, the WEB-SG is a suitable measurement of WEB-S and WEB-G in Hungarian and Norwegian non-clinical subsamples.

In addition, our aim was to test the measurement invariance of the WEB-SG in Hungarian and Norwegian subsamples. Our results supported the configural and metric invariances—but not the scalar invariance—between the two subsamples. This pattern indicates that although the factor structure and factor loadings showed a similar pattern for Hungarian and Norwegian individuals, the thresholds or means of the items on the WEB-SG were different for the two groups. In general, the Hungarian participants had higher mean scores on elements of the WEB-SG.

The correlation analyses revealed in both subsamples that WEB-S and WEB-G are in moderately or strong relationships with characterological,

**Table 5.** Association between latent factors of weight- and body-related shame and guilt and external covariates among Hungarian and Norwegian participants (multiple group MIMIC-model).

	Hungarian sample			Norwegian sample		
	WEB-G	WEB-S	Wald-test for comparison of $\beta$ s (p)	WEB-G	WEB-S	Wald-test for comparison of $\beta$ s (p)
Sex <sup>1</sup>	<b>0.10</b>	<b>0.10</b>	0.21 (p = 0.649)	0.05	0.00	0.76 (p = 0.383)
Age	0.00	-0.04	0.59 (p = 0.443)	-0.01	-0.08	1.13 (p = 0.287)
Level of education <sup>2</sup>	0.04	-0.04	3.59 (p = 0.058)	-0.01	0.02	0.11 (p = 0.746)
Previous chronic physical or mental disorder <sup>3</sup>	-0.04	0.00	1.00 (p = 0.317)	-0.02	<b>0.11</b>	<b>5.66 (p = 0.017)</b>
Body mass index	0.04	<b>0.19</b>	<b>8.08 (p = 0.005)</b>	-0.01	0.10	2.19 (p = 0.139)
Dieting <sup>4</sup>	<b>0.64</b>	<b>0.28</b>	<b>38.51 (p &lt; 0.001)</b>	<b>0.39</b>	0.01	<b>8.57 (p = 0.003)</b>
Bulimia & food preoccupation <sup>4</sup>	<b>0.12</b>	0.03	<b>5.02 (p = 0.025)</b>	0.09	0.12	0.19 (p = 0.662)
Oral control <sup>4</sup>	<b>-0.15</b>	-0.02	<b>13.17 (p &lt; 0.001)</b>	<b>-0.35</b>	-0.10	<b>6.68 (p = 0.010)</b>
Behavioral shame <sup>5</sup>	<b>0.08</b>	0.03	1.54 (p = 0.214)	-0.04	0.01	0.29 (p = 0.592)
Bodily shame <sup>5</sup>	<b>0.16</b>	<b>0.46</b>	<b>15.73 (p &lt; 0.001)</b>	<b>0.62</b>	<b>0.77</b>	<b>3.98 (p = 0.046)</b>
Characterological shame <sup>5</sup>	0.01	0.09	1.45 (p = 0.229)	0.01	0.02	0.04 (p = 0.850)
R <sup>2</sup>	77.8%	66.1%		69.5%	75.5%	

Note. Standardized regression coefficients presented with bold are significant at least  $p < 0.05$  level. Wald test statistics presented with bold indicate a significant difference at least  $p < 0.05$  level between standardized regression coefficients in terms of the strength of association with latent factors in each group. <sup>1</sup> – Sex: coded as 0 = assigned male at birth (AMAB), 1 = assigned female at birth (AFAB); <sup>2</sup> – Level of education: coded as 0 = Participant did not graduated at university or college, 1 = Participant graduated at university or college; <sup>3</sup> – Previous chronic physical or mental disorder: coded as 0 = No, 1 = Yes; <sup>4</sup> – Subscale scores of the EAT; <sup>5</sup> – Subscale scores of the ESS. Correlation between Shame and Guilt latent factor: Hungarian participants -  $r = 0.45$ ; Norwegian participants -  $r = 0.48$ . WEB-G: weight- and body-related guilt; WEB-S: weight- and body-related shame.

behavioral, and body aspects of general shame and with dieting as a restrictive EAT-factor. WEB-S was also positively associated with BMI in the Norwegian and Hungarian subsamples. This result partially supports our hypothesis about the relationship between restrictive eating attitudes and WEB-G, based on the structural and process models of self-conscious emotions (Lewis, 1992; Tracy and Robins, 2004) and Goss and Gilbert's (2002) model of anorexia-specific shame. We must emphasize, however, that these theoretical models describe rather the general than the weight-, and body specific shame or guilt. In addition, our results are consistent with those of Conrads et al. (2007) in terms of the relationship between BMI and WEB-S.

We found that body shame was associated with both weight- and body-related factors. These results confirm that the WEB-SG factors represent body-specific self-conscious emotions, as Conrads et al. (2007) intended. Furthermore, our findings indicated that dieting and oral control are related to WEB-G, but not with WEB-S, in the Hungarian and Norwegian subsamples. These results support our hypothesis, based on the structural and process models of self-conscious emotions (Lewis, 1992; Tracy and Robins, 2004) and the results of the study by Troop and Redshaw (2012) but contradict Goss and Gilbert's theory (Goss and Gilbert, 2002), especially with regard to self-conscious emotions related to weight and body. Our results suggest that WEB-G is a more critical factor in restrictive eating attitude than WEB-S. According to Goss and Gilbert (2002), a person with anorexic symptoms feels excessive general and body shame, and inferiority. This is the first step in Goss and Gilbert's theory of a shame-pride spiral. Patients try to solve this state by controlling their eating, diet, and body shape. If they are successful, they may feel pride for a short time. If they are not successful - because they make a mistake in their diet plan or they are dissatisfied with their body— they probably feel guilt, as Lewis (1992), Tracy and Robins (2004) and Tangney and Tracy (2012) had previously explained. According to Ferguson and Crowley (1997) lasting behavioral mistakes can lead to the presence of high levels of ruminative (maladaptive) guilt with high level of distress. Based on these theories and our results, the shame-ruminative (weight- and body related) -guilt spiral seems to be a better explanation of anorexia symptoms than shame or pride. These models above are based on general self-conscious emotions, but it is important to note that our results tend to suggest a role of weight- and body-related guilt in this process. However, bulimia and food preoccupation factors are not a significant predictor of WEB-S, as we had hypothesized. Thus, our result

does not support shame-related theories of bulimia (e.g., Goss and Gilbert, 2002).

In addition, BMI positively associates with WEB-S and not with WEB-G, but only in the Hungarian subsample. This result reinforces our hypothesis of a relationship between BMI and WEB-S in normative-weight individuals, and it is consistent with the results of Conrads et al. (2007). According to our results, higher BMI is associated with higher levels of WEB-S in Hungary. Although we did not find relevant study on the differences in EDs between Central and Northern Europe, data from 2019 suggest that the rate of adult overweight population ( $BMI \geq 25$ ) is higher in Hungary (60%) than in Norway (51%) (Eurostat, 2021). Our result highlights perceived, or real weight gain can be associated with WEB-S among normative-weight individuals. It is possible, that feelings of WEB-S can reduce health behaviors because feelings of shame correlate with powerlessness, and lack of execution of adaptive actions (e. g. Tangney and Tracy, 2012), leading to noncompliance in health-behavior-focused weight loss interventions in Hungary.

#### 4.1. Limitations

Due to the cross-sectional nature of this study, it was impossible to determine causal relationships between the variables. Furthermore, recall bias might have influenced the responses on the applied self-reported instruments. There were differences in sample size and background characteristics between the Hungarian and Norwegian subsamples, which could have influenced our results. Unfortunately, we could not find any relevant research results on levels of shame and stigmatization for comparison between the two nations. Thus, further investigation is required for more precise comparisons of general and weight- and body-related shame and guilt and stigmatization levels between individuals from Hungary and Norway. In addition, although we are aware of the important outcomes of eating disorders among non-binary individuals (Hadland et al., 2014; Brown and Keel, 2012), we only distinguished between assigned male at birth (AMAB) and assigned female at birth (AFAB). For this reason, our results may not provide comprehensive picture of eating difficulties. Finally, the present study did not assess the incremental validity of the WEB-SG, for example measuring the extent of contribution of the WEB-SG subscales over the effect of chronic body shame regarding the explained variance of maladaptive eating attitudes and behaviors.

In the future, a new survey should be designed, using a pride scale to assess the role of pride in eating difficulties and apply detailed gender distinction. In addition, a comprehensive investigation of the relationship between body-related self-conscious emotions and emotion dysregulation is needed.

#### 4.2. Implications

Our results should be interpreted with caution due to the characteristics of our samples. Nevertheless, our main result, such as WEB-SG is a suitable measurement of weight-and body -related shame and guilt in non-clinical subsamples in two different countries, and weight-and body-related guilt is a more crucial factor in restrictive eating attitude than weight- and body-related shame, are significant to screening and assessing for subclinical and clinical eating disorders. Based on our assumption, severe eating disorders and their consequences can be prevented by psychoeducating young adults about weight- and body related shame and guilt for young adults. The importance of using adaptive emotion regulation strategies should be emphasized in the process of prevention and intervention of EDs, as suggested by Christensen and Haynos (2020).

Clinical eating disorders are often difficult to treat with standard cognitive behavioral therapy (CBT) (Fairburn et al., 1991; Linardon et al., 2018; Linardon and Wade, 2018; Shapiro et al., 2007). Due to the high drop-out and relapse rates (Fairburn et al., 1991; Linardon et al., 2018; Linardon and Wade, 2018; Shapiro et al., 2007) patients with ED require complex treatment modalities, such as schema therapy (Simpson, 2012). Several research has shown that patients with EDs pathology have some specific early maladaptive schemas (e.g., Meneguzzo et al., 2020; Unoka et al., 2010) and schema modes, such as "Shamed Child mode" with internalized body shame (Simpson, 2012). As the schema - focused cognitive treatment model suggests, body shame may be central to effective treatment of people with ED. Our results highlight not only on body shame but also on body guilt, thus both could be focused on in the treatment of eating disorders for better outcomes.

#### 5. Conclusions

In conclusion, we have confirmed the measurement model of WEB-SG in Hungarian and Norwegian subsamples. In addition, WEB-S and WEB-G are well-defined and separate constructs based on their predictors. According to our main results, WEB-G is associated with dieting as a restrictive behavior, and WEB-S is associated with higher BMI and chronic body shame. In our opinion, maladaptive WEB-G is a relevant factor in proneness to anorexia. In addition, stigmatization may increase a perceived or real overweight person's body shame. Powerlessness is one of the negative consequences of shame, and powerlessness may prevent the development of adaptive, healthy eating behaviors and weight loss. These results highlight WEB-G and WEB-S as two critical factors in the treatment of eating difficulties.

#### Declarations

##### Author contribution statement

Gabriella Vizin: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Wrote the paper.

Zsolt Horváth: Analyzed and interpreted the data; Wrote the paper.

Tünde Vankó: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Róbert Urbán: Conceived and designed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

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#### Data availability statement

Data will be made available on request.

#### Declaration of interests statement

The authors declare no conflict of interest.

#### Additional information

No additional information is available for this paper.

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