



## Psychometric properties and measurement invariance across gender of the Compulsive Online Shopping Scale (COSS) among Iranians

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### ABSTRACT

The present study aimed to investigate the psychometric properties and measurement invariance of the Compulsive Online Shopping Scale (COSS) in an Iranian population. The total sample of 802 participants (257 females; Mean age = 22.27, SD = 2.83) were selected via convenience sampling from Tehran, Iran. Confirmatory Factor Analysis supported the 7-factor structure of the COSS as proposed in the original study. The measurement invariance found in this study suggests that the COSS provides sufficiently unbiased use among males and females. The current findings also support the concurrent validity of the Persian COSS, which exhibited positive and significant associations with loneliness, impulsivity, obsession, internalized symptoms, and Internet use. Furthermore, results confirm the convergent validity of the Persian COSS and showcased acceptable internal consistency for all factors, and the total score. The findings of the present study indicate that compulsive online shopping could be assessed adequately in Iranian samples using the COSS.

### 1. Introduction

Addictive behaviors refer to a group of behaviors associated with lack of control, dysfunction, salience, and mood modification (Rosenberg & Feder, 2014). The term “behavioral addictions”, which refers to the phenomena of non-chemical addictions (Kardefelt-Winther et al., 2017), has three primary characteristics: Exposure to environmental stimuli for specific activities provoke psychophysiological reactions; engaging in the activity despite its negative effects; and the inability to cease the activity despite desiring to do so (Akbari et al., 2021). Behavioral addictions share similarities with substance addictions in terms of symptoms and consequences, but in the former, there are no physical symptoms and substance use involved (Alavi et al., 2012). Various forms of behavioral addictions have been identified, including Gambling Disorder, problematic gaming, and problematic social media use (Griffiths, 2005; Akbari et al., 2021). Furthermore, it has been argued that compulsive shopping could be considered a form of behavioral addiction (Griffiths, 2005). To specify, in Griffiths’ component model of addiction (Griffiths, 2005), compulsive online shopping is

characterized by the salience of online shopping in the affected person’s life (e.g., widespread preoccupation, constant craving), engaging in shopping as a means to alter mood, increasing tolerance (i.e., increasing online shopping over time), withdrawal symptoms when unable to shop online, and interpersonal conflict. To the best of the author’s knowledge, there is not yet a validated instrument in the Persian language for the assessing online shopping addiction. Therefore, the present study aimed to translate and validate the Compulsive Online Shopping Scale (COSS; Manchiraju et al., 2017).

#### 1.1. Compulsive online shopping

Compulsive online shopping is defined as a preoccupation with frequent buying episodes and overpowering and senseless urges to buy goods (Müller et al., 2015). Research on compulsive shopping dates back more than three decades (O’Guinn and Faber, 1989; Scherhorn, 1990). However, given the technological advancements and the emergence of the internet, compulsive online shopping is a growing novel concern (Manchiraju et al., 2017). Online buyers do not objectively see the

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amount of money spent, and the number of shopping items bought, so they may underestimate both (Günüç & Keskin, 2016). Therefore, online shopping platforms may create an environment where shopping can easily become a problematic behavior (Müller et al., 2022). It is possible that compulsive online shopping is separate to, or a subtype of, the traditional form of compulsive shopping (Müller et al., 2021).

Müller et al. (2021) proposed seven symptoms as diagnostic symptoms of compulsive online shopping: Buying too many items without using them for their intended purpose, self-regulation of buying, impulses of buying, dysfunctions in important areas of life, lack of control, emotional and cognitive symptoms after stopping shopping, and maintenance or escalation of dysfunctional buying. The proposed diagnostic criteria can serve as the foundation for the development of diagnostic interviews and severity measurements of compulsive shopping (Müller et al., 2021).

### 1.2. Correlates of compulsive online shopping

Various factors are related to compulsive online shopping, including psychological factors such as low self-esteem (Rose and Dhandayudham, 2014; Zheng et al., 2020), high level of stress (Roberts and Roberts, 2012; Zheng et al., 2020), negative emotional states (Rose and Dhandayudham, 2014; Mueller et al., 2011b), obsessional tendencies (He et al., 2018), impulsivity (Bighiu et al., 2015; Khanbabaie et al., 2022) identity confusion (Sharif and Khanekharab, 2017), materialistic values (Sharif and Khanekharab, 2017; Pahlevan Sharif et al., 2022; Mueller et al., 2011b), social anonymity (Rose and Dhandayudham, 2014), and upward social and financial comparison (Zheng et al., 2020; Pahlevan Sharif et al., 2022). Furthermore, compulsive online shopping may lead to financial problems (Joireman et al., 2010; Brougham et al., 2011, Liu et al., 2021), psychological distress (Liu et al., 2021), interpersonal conflicts and loneliness (Lejoyeux & Weinstein, 2010), depression (LaRose & Eastin, 2002), and anxiety (Gori et al., 2022).

### 1.3. Prevalence of compulsive online shopping and measures of this construct

The prevalence of compulsive online shopping is around 5% (Maraz et al., 2016), with rates found to be 3% in Germany (Adamczyk, 2021), 5% in the USA (Black, 2022), and 11% in Eastern Europe (Tarka & Kukar-Kinney, 2022). Generally, most of the studies in this field belong to industrialized countries, and these studies have not been replicated with Middle Eastern or African population samples. In general, research on compulsive shopping is focused on the female gender, because this group is more vulnerable to compulsive shopping (Mueller et al., 2011a).

Previous studies developed scales to assess compulsive shopping including: the modified Yale-Brown Obsessive-compulsive Scale - Shopping Version (Monahan et al., 1996), the Compulsive-buying Measurement Scale (Faber & O'Guinn, 1992), the Questionnaire about Buying Behavior (Lejoyeux, Ades, 1997); and the Compulsive-buying Index (Ridgway et al. 2008). Over the last decade, internet users have reached 5 billion (Marketing, 2020). Due to increases in internet accessibility many new online shopping mediums (e.g., Amazon, Alibaba, etc.) have expanded. The aforementioned scales all suffer from a key limitation of ignoring items relating to online shopping. In view of this, Manchiraju and colleagues. (2017) developed a new scale (the Compulsive Online Shopping Scale; COSS) to assess online shopping consistent with addictive behaviors criteria (Griffiths, 2005). The psychometric properties of the COSS were evaluated in Italian and Malaysian populations, which found that the COSS is a valid and reliable self-report scale to assess the risk of compulsive online shopping (Chuah et al., 2018; Gori et al., 2022).

### 1.4. Aim of the study

The present study aimed to investigate the psychometric properties of the COSS as developed by Manchiraju and colleagues (2017) in an Iranian population. In order to achieve this aim, the present study attempted to: (i) investigate the structural validity of the COSS through Confirmatory Factor Analysis (CFA), (ii) evaluate the internal consistency of the COSS, (iii) assess the concurrent validity as well as convergent validity of the COSS, and (iv) evaluate the psychometric equivalence (measurement invariance) of the COSS between females and males.

## 2. Methods

### 2.1. Participants and procedures

The study was conducted on a sample of 802 people, aged between 18 and 59 (70% were <30 years old), in Tehran, Iran. The sample was comprised of 257 females and 546 males (Mage = 22.27 years, SD = 2.83). In terms of education, 61 participants had a high school qualification, 184 had associate degrees, 345 had a bachelor's degree, 157 had a master's degree, and 55 had a doctoral degree. The total sample of 802 participants was recruited via convenience. Data were collected through digital apps on smartphones and computers. Specific advertisements were put on certain social networks and platforms such as Telegram to recruit the sample. All participants completed a consent form at the beginning of the study describing the purpose of the study. All ethics procedures were in accordance with the 1989 Helsinki Declaration and its later amendments or comparable ethical standards. Because some of the scales had not been validated in Iran, for the purposes of the present study, the English version of the scales were translated into Persian by Iranian authors and a bilingual psychologist. Following this, the equivalence of the two versions was checked and confirmed. In addition, the first version for rating the understandability and fluency of each item was completed by participants from the general population in a pilot study. This process did not result in any changes in items, and the final version of the Persian scales was confirmed.

### 2.2. Measures

All scales administered in the study were the Persian forms of the original scales.

#### 2.2.1. Socio-demographics

The survey asked for general demographic information including age, gender, education, and income.

#### 2.2.2. The Compulsive Online Shopping Scale (COSS; Manchiraju et al., 2017)

Compulsive online shopping is defined as a preoccupation with frequent buying episodes and overpowering and senseless urges to buy goods (Müller et al., 2015). The 28-item COSS (Manchiraju et al., 2017) was developed to assess compulsive online shopping generally and in relation to its components. The COSS comprises seven factors including salience (excessive preoccupation with online shopping in comparison to other activities), mood modification (using online shopping as a way to alter down mood), conflict (interpersonal and functional), tolerance (need to engage in online shopping more to experience the same effects), relapse (unsuccessful attempts to quit compulsive online shopping), withdrawal (experiencing mood alternation and craving due to the absence of online shopping), and problems (behavioral and financial). Items (e.g., "Sometimes I shop online in order to feel better") are rated on a seven-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). Higher scores indicate higher levels of compulsive online shopping tendencies. The COSS comprises seven factors which act as subscales in terms of scoring (Manchiraju et al., 2017). This means the total score of

COSS is a sum of these seven factors scores.

### 2.2.3. The Depression, Anxiety, Stress- 21 (DASS-21; Lovibond & Lovibond, 1995)

The 21-item DASS-21 (Lovibond & Lovibond, 1995; Persian version: Asghari et al., 2008) comprises three self-report subscales: anxiety, depression, and stress (seven items each). Items (e.g., “I couldn’t seem to experience any positive feeling at all”) are rated on a four-point Likert scale from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). Higher scores indicate higher levels of anxiety, depression, and stress. Persian forms of the DASS-21 have shown good internal consistency and convergent validity (Asghari et al., 2008; Samani & Jokar, 2009). The Cronbach alpha of the Persian total DASS-21 in the present study was 0.93.

### 2.2.4. The three-item short form of the UCLA loneliness Scale (UCLALS; Hughes et al., 2004)

The three-item UCLALS (Hughes et al., 2004) is a unidimensional construct. Items (e.g., “how often do you feel that you lack companionship”) are scored based on a three-point Likert scale from 1 (hardly ever) to 3 (often). Higher scores indicate higher levels of loneliness. Due to the lack of Persian version of the UCLALS, bilingual authors and psychologists translated the items into Persian, then two other psychologists, back-translated items into the original language. After comparing the translation with the original version of the scale, the result was satisfactory. The Persian UCLALS was then piloted with 113 participants (mean age = 15.4 years ± 1.97 years, males = 54%). The Cronbach alpha of the Persian UCLALS in the present study was 0.77.

### 2.2.5. The internet abusive use Questionnaire (IAUQ; Calvo-Francés, 2016)

The 12-item IAUQ is a unidimensional measure. Items (e.g., “Do you ever find that you stay on Internet much longer than intended”) are scored based on a 5-point Likert from 0 (totally disagree) to 4 (totally agree). Higher scores indicate higher levels of problematic internet use. The structural validity and adequate indices of convergent validity and discriminative capacity for the original version of the IAUQ have been confirmed (Calvo-Francés, 2016). The Persian version of the IAUQ has demonstrated strong internal consistency (Cronbach’s alpha = 0.91) and validity (Mottaghi & Safai, 2017). The Cronbach alpha of the Persian IAUQ in the present study was 0.89.

### 2.2.6. The Yale-Brown Obsessive compulsive Scale (YOCS; Goodman et al., 1989)

The 10-item YOCS comprises two factors, namely obsessions and compulsions. Items (e.g., “Time occupied by obsessions”) are scored based on a 5-point Likert from 0 (no symptoms) to 4 (extreme symptoms). Higher scores indicate higher levels of obsessional behavior. The internal consistency (Cronbach alpha = 0.89) of the original YOCS is strong (Goodman et al., 1989). The Persian version of the Y-BOCS has shown optimal levels of internal consistency and test–retest reliability (Esfahani et al., 2012). The Cronbach alpha of the Persian YOCS Scale in the present study was 0.91.

### 2.2.7. The Barratt Impulsiveness Scale-11 (BIS-11; Patton et al., 1995)

The 30-item BIS-11 comprises three factors: attentional impulsiveness, motor impulsiveness, and non-planning impulsiveness. Items (e.g., “I plan for the future”) are scored based on a 4-point Likert from 1 (never) to 7 (always). Higher scores indicate higher levels of impulsivity. The Persian version of the BIS-11 has demonstrated acceptable internal consistency (Cronbach’s alpha = 0.81) and test–retest scores (0.77) (Javid et al., 2012). The Cronbach alpha of the Persian BIS-11 in the present study was 0.84.

## 2.3. Statistical analyses

First, the structure of the COSS was examined through a series of confirmatory factor analyses (CFAs): A seven-factor model (with *Saliency, Mood Modification, Conflict, Tolerance, Relapse, Withdrawal, and Problems* as latent factors with covariance indicators drawn between them) in correspondence to the model proposed by Manchiraju et al. (2017), a higher order model (with the five indicators and Compulsive Online Shopping as higher-order construct), and a mono-factorial model in which all items are loaded on a single latent variable named COSS. The *chi-square* fit statistics divided by degree of freedom (CMIN/DF), comparative fit index (CFI), the incremental fit index (IFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA, 90% CI), were evaluated for the model fit. The adequacy of cutoff criteria for model fit was CMIN/DF ≤ 3, IFI, CFI and the TLI ≥ 0.900, RMSEA ≤ 0.050 (West et al., 2012).

Measurement invariance was used to assess the level of invariance between genders (females vs. males). Measurement invariance is the evaluation of the psychometric equivalence of a construct among groups or across time. Measurement non-invariance indicates that a construct has a different structure to various groups and so the construct cannot be reliably tested or assessed across groups or across time. In the case of COSS gender is a key characteristic as previous studies have indicated that compulsive shopping is more prevalent among females, thus in the present study the gender measurement invariance was investigated. The level of measurement invariance was calculated by comparing increasingly more constrained models that tested for *configural* (i.e., invariance of the factor structure between genders), *metric* (i.e., equality of the factor loadings between genders), and *scalar* (i.e., equality of the factor loadings and the intercepts between genders) invariance. The cutoff values of fit index compared with the less restrictive model was ΔCFI ≤ 0.010 and ΔRSMEA ≤ 0.015 (Schmitt & Kuljanin, 2008). Furthermore, the Persian COSS’s reliability was investigated using the internal consistency coefficient (Cronbach’s alpha for total score and subscales of the COSS).

Finally, the concurrent validity of the COSS was computed by bivariate correlations between the seven subscales of the COSS and age, gender, online buying frequency, loneliness, impulsivity, obsession, internalized symptoms (DASS-21), and internet use. These variables were selected based on previous studies which indicated strong correlations with other addictive behaviors, especially compulsive online shopping (Khanbabaei et al., 2022; Gori et al., 2022; Liu et al., 2021; Zheng et al., 2020; Brougham et al., 2011). Analyses were conducted using IBM Amos 24 (Arbuckle, 2011) and IBM SPSS 26 (SPSS Inc., Chicago, Ill., USA) software.

## 3. Results

Table 1 presents demographic and descriptive data on the study variables.

**Table 1**  
Descriptive statistics of the study variables.

	Mean	Std. Deviation	Skewness	Kurtosis
Age	27.89	8.14	0.96	0.40
Gender	1.32	0.46	0.77	-1.40
Education	2.95	1.00	0.05	-0.26
Income	2.70	1.17	0.50	-0.56
Time spent on the internet/day	3.18	1.14	0.067	-0.94
Online buying frequency	1.76	1.05	1.08	-0.23
Internalized symptoms	27.74	13.15	0.24	-0.65
Loneliness	6.18	1.90	-0.09	-1.03
Impulsivity	33.20	9.22	0.20	0.18
Obsession	14.53	7.79	0.33	-0.38
Problematic internet use	33.72	10.77	-0.06	-0.60

### 3.1. CFA of the Persian COSS

As the Manchiraju and colleagues' (2017) study proposed a seven-factor structure for the scale, a CFA was conducted according to the seven factors and corresponding items identified. On the first analytical trial, the CFA model fit was as follows: CMIN/DF: 5.596, CFI: 0.897, TLI:0.821, IFI:0.840, RMSEA: 0.093 \*\* which indicated an inadequate fit, but following the modification indices (MI)<sup>1</sup> proposed by AMOS 24 an acceptable fit was obtained: CMIN/DF: 3.865, CFI: 0.939, TLI: 0.926, IFI: 0.939, RMSEA: 0.060\*\*. Furthermore, all seven factors were significantly correlated with each other ( $p < 0.001$ ). Meanwhile the factor loadings were greater than 0.40 which is adequate (Jackson et al., 2009) as is presented in Table 2. All factor loadings were statistically significant ( $p < 0.001$ ).

To confirm the actual model fit adequacy of the seven-factorial solution (see Fig. 1), an analysis between the models was conducted by comparing the mentioned fit indices. As shown in Table 3, the seven-factor model had significantly superior statistical fit indices compared to the mono-factorial model. As the final optimal seven factor model was adjusted through MI, the same procedure was conducted in the mono-factorial model (See Fig. 2), but the optimal fit was not achieved, and this model was considered inferior to the seven-factor in terms of statistical fitness. On the other hand, the higher-order model proposed an acceptable fit but was slightly inferior to the seven factor model in terms of model fitness (see Fig. 3).

### 3.2. Measurement invariance testing of the Persian COSS

Statistics of the measurement invariance testing of the seven-factor model are presented in Table 4. The seven-factor model suggested satisfactory levels of model fit based on the CFI and TLI, and acceptable levels of model fit according to the RMSEA between both genders. Moreover, the configural invariance model, the metric invariance model, and the scalar invariance model between gender-based groups were also characterized by satisfactory model fit as based on the CFI and TLI, and good and acceptable model fit based on the RMSEA. Only low rates of degradation were obtained in model fit between the configural invariance models (gender-based invariance testing:  $\Delta\chi^2 = 135.661$ ;  $p < .001$ ;  $\Delta CFI = 0.008$ ;  $\Delta TLI = -0.006$ ;  $\Delta RMSEA = 0.002$ ), and between the metric and scalar invariance models (gender-based invariance testing:  $\Delta\chi^2 = 51.95000$ ;  $p < .001$ ;  $\Delta CFI = 0.002$ ;  $\Delta RMSEA = 0.000$ ) Therefore, according to Chen's (2007) suggestions, scalar invariance was confirmed for the seven-factor model between both genders.

### 3.3. Internal consistency of the Persian COSS

Cronbach's alpha estimated the internal consistency of the COSS. Cronbach's alpha coefficients for the seven factors of the COSS were as follows: salience = 0.83, mood modification = 0.86, conflict = 0.74, tolerance = 0.84, relapse = 0.81, withdrawal, and problems = 0.81. In addition, the Cronbach's alpha coefficient for the total COSS score was 0.94. The Cronbach's alphas of the COSS were all above 0.70, which was considered as acceptable internal consistency (Taber, 2018).

### 3.4. Concurrent validity of Persian COSS

Bivariate correlations among the COSS subscales and the validating variables are shown in Table 5. The results indicated significant and positive associations between loneliness, impulsivity, obsession, internalized symptoms, and internet use, and all subscales of the COSS except for one (i.e., tolerance and loneliness). Age and gender didn't demonstrate strong correlation with the COSS subscales.

<sup>1</sup> An MI is an estimate of the quantity by which the chi-square would be decremented if a parameter restriction were omitted from the model.

**Table 2**

COSS items and their standardized factor loadings (n = 802).

Item/factor	Loading
<b>Factor 1: Salience</b>	
1. Online shopping/buying is the most important thing in my life.	0.61***
2. I think about online shopping/buying things all the time.	0.76***
3. I spend a lot of time thinking of or planning online shopping/buying.	0.80***
4. Thoughts about online shopping/buying keep popping in my mind.	0.77***
<b>Factor 2: Mood modification</b>	
5. Sometimes I shop online in order to feel better.	0.80***
6. Sometimes I shop/buy things online in order to change my mood.	0.81***
7. I shop/buy things online in order to forget about personal problems.	0.92***
8. I shop/buy things online in order to reduce feelings of guilt, anxiety, helplessness, loneliness, and/or depression.	0.79***
<b>Factor 3: Conflict</b>	
9. I shop/buy online so much that it negatively affects my daily obligations(e.g., school and work)	0.81***
10. I give less priority to hobbies, leisure activities, job/studies, or exercise because of online shopping/buying.	0.86***
11. I have ignored to love partner, family, and friends because of online shopping/buying.	0.84***
12. I often end up in arguments with other because of online shopping/buying.	0.65***
<b>Factor 4: Tolerance</b>	
13. I feel an increasing inclination to shop/buy things online.	0.48***
14. I shop/buy online much more than I had intended/planned.	0.76***
15. I feel I have to shop/buy more and more online to obtain the same satisfactions as before.	0.77***
16. I spend more and more time shopping/buying online.	0.81***
<b>Factor 5: Relapse</b>	
17. I have tried to cut down on online shopping/buying without success.	0.74***
18. I have been told by others to reduce online shopping/buying.	0.70***
19. I have decided to shop/buy less online, but have not been able to do so.	0.80***
20. I have managed to limit online shopping/buying for periods, and then experienced relapse.	0.79***
<b>Factor 6: Withdrawal</b>	
21. I become stressed if obstructed from shopping/buying things online.	0.75***
22. I become sour and grumpy if I for some reasons cannot shop/buy things online when I feel like it.	0.66***
23. I feel bad if I for some reason I am prevented from shopping/buying things online.	0.73***
24. If it has been a while since I last shopped online, I feel a strong urge to shop/buy things.	0.70***
<b>Factor 7: Problems</b>	
25. I shop/buy online so much that it has caused economic problems.	0.86***
26. I shop/buy online so much that it has impaired my well-being.	0.81***
27. I have worried so much about my online shopping problems that it sometimes has made me sleepless.	0.73***
28. I have been bothered with poor conscience because of my online shopping/buying.	0.63***

Note. Level of significance: \*\*\* $p < .001$ .

### 3.5. Convergent validity of Persian COSS

A hierarchical regression (see Table 6) was conducted to evaluate the convergent validity of the Persian COSS. In this analysis the COSS was the outcome variable, and the demographic variables, internalized symptoms, loneliness, impulsivity, obsession, and problematic internet use were the predictor variables. The regression was performed in three steps. In step 1, age, gender, education, income, time spent on the internet/day, and online buying frequency were entered into the model. Only online buying frequency ( $\beta = 0.355***$ ) and time spent on the internet/day ( $\beta = 0.072^*$ ) were significant predictors at this step. In step 2, age, gender, education, income, time spent on the internet/day, online buying frequency, internalized symptoms, loneliness, impulsivity, and obsession were entered into the model. Online buying frequency ( $\beta = 0.37***$ ), education ( $\beta = 0.067^*$ ) internalized symptoms ( $\beta = 0.1^*$ ), obsession ( $\beta = 0.122^{**}$ ) were significant predictors in this step. In step 3,



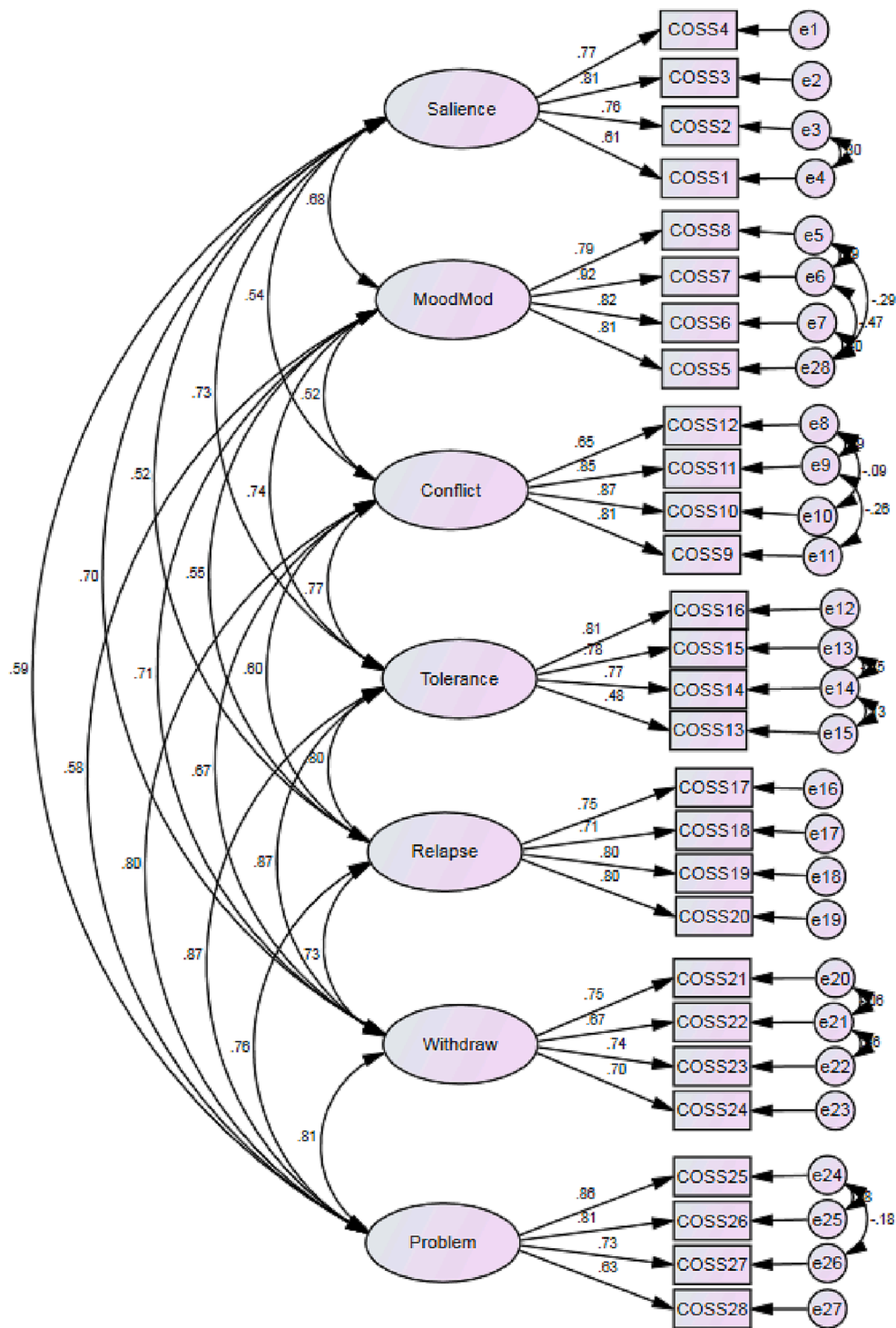


Fig. 1. The adjusted seven factor model with factor loadings of each item.

Table 3

Fit indices of the COSS for two seven-factorial and mono-factorial models and chi-square variation test.

	$\chi^2$	df	P	$\chi^2/df$	CFI	IFI	TLI	RMSEA	$\Delta\chi^2$	$\Delta df$	P
Model1_Seven factor model (Adjusted)	1217.331	315	< 0.001	3.865	0.939	0.939	0.926	0.06	-	-	< 0.001
Model2_Higher order model (Adjusted)	1371.779	329	< 0.001	4.17	0.929	0.929	0.919	0.063	154.448	14	< 0.001
Model3_Mono-factorial model (Adjusted)	2464.929	333	< 0.001	7.402	0.855	0.855	0.835	0.089	1247.598	18	< 0.001

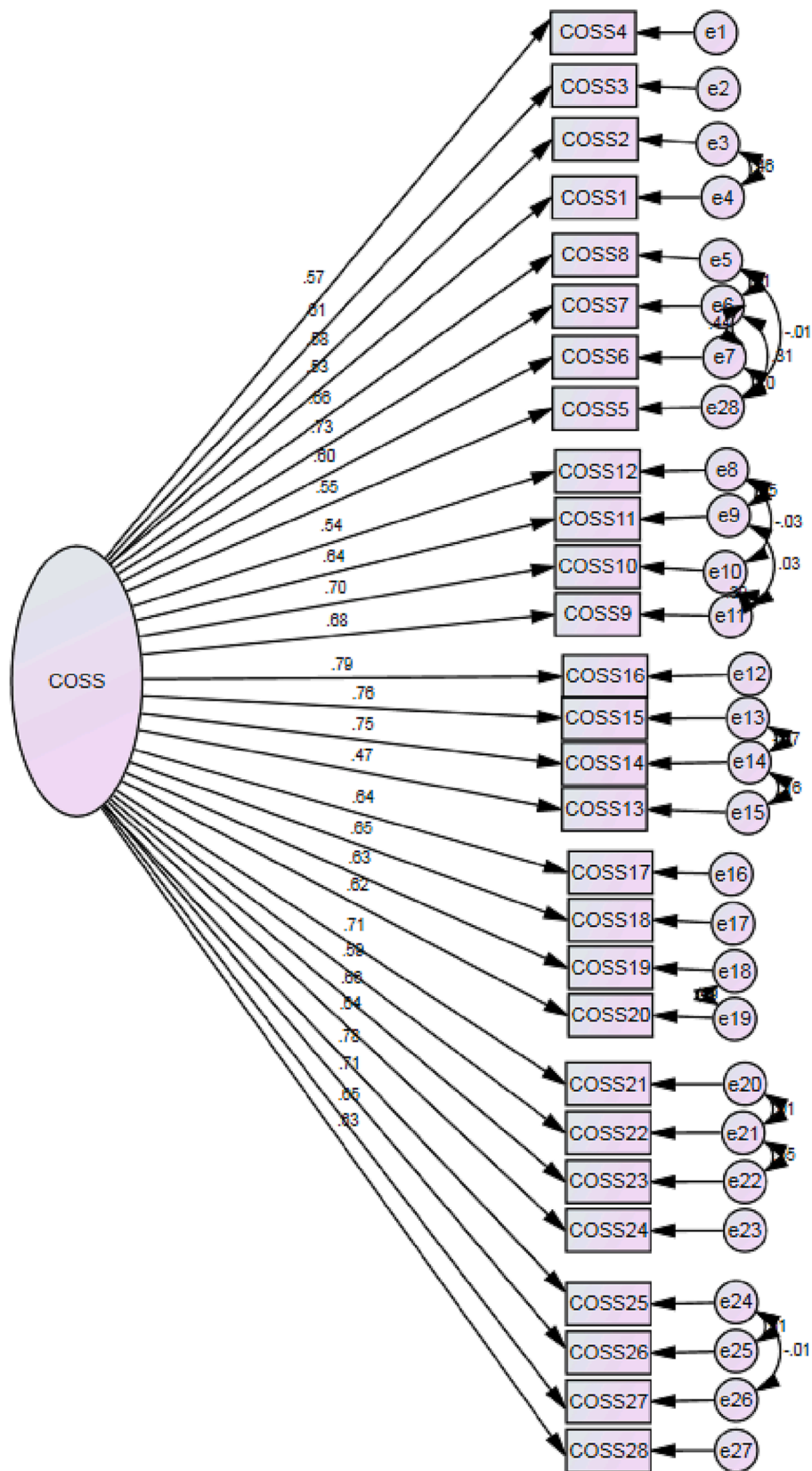


Fig. 2. The adjusted mono-factorial model with factor loadings for each item.

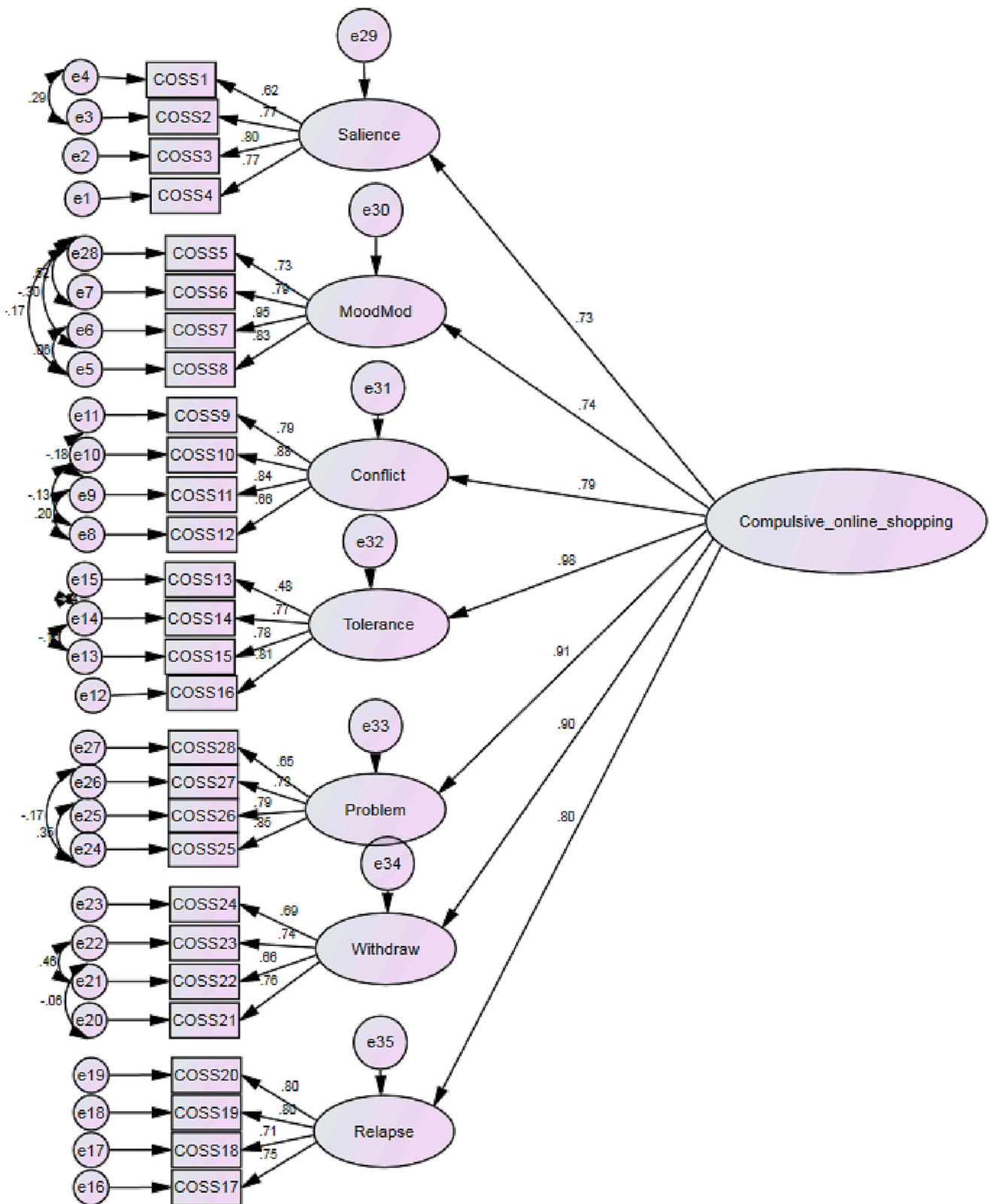


Fig. 3. The adjusted Higher-order model with factor loadings for each item.

online buying frequency ( $\beta = 0.377^{***}$ ), education ( $\beta = 0.079^*$ ), obsession ( $\beta = 0.091^*$ ), problematic internet use ( $\beta = 0.244^{***}$ ) were significant predictors in the last step. The  $R^2$  of the regression model in 3 steps were  $0.144^{***}$ ,  $0.188^{***}$ ,  $0.225^{***}$  respectively. This means that the final model predicted the 22.5% of the COSS's variance.

#### 4. Discussion

The present study aimed to examine the psychometric properties of the Persian COSS via a CFA. The findings of the present study supported the seven-factor structure of the COSS as proposed in Manchiraju and

**Table 4**  
Measurement invariance testing.

	$\chi^2$ (df)	p	CFI	TLI	RMSEA [90% CI]
Configural invariance	1803.656 (630)	<0.001	0.923	0.908	0.048 [0.046; 0.051]
Metric invariance	1939.317 (651)	<0.001	0.915	0.902	0.050 [0.047; 0.052]
Scalar invariance	1991.267 (672)	<0.001	0.913	0.903	0.050 [0.047; 0.052]

Note.  $\chi^2$  (df): chi-square test of model fit (degrees of freedom). CFI: comparative fit index. TLI: Tucker-Lewis index. RMSEA [90% CI]: root mean square error of approximation [90% confidence interval].

colleagues' (2017) study. The Persian COSS showcased good reliability at the item, scale, and person level. Moreover, robust psychometrics were identified. These showed that the Persian COSS can discriminate levels of compulsive online shopping among Iranian adults. The findings of the present study indicated that the seven-factorial structure proposed by Manchiraju et al. (2017) expresses a significantly superior goodness of fit in comparison to the mono-factorial structure. On the other it is possible to assume that the seven factors proposed by Manchiraju et al. (2017) can be taken together as a single construct, as the higher-order model proposed an acceptable fit. Previous studies reported similar findings using CFA in Italian (Gori et al, 2022) and Malaysian (Chuah et al, 2018) samples.

To the best of our knowledge no previous studies have investigated the gender invariance of COSS and the present study is the first one to assess this. The measurement invariance found in this study suggests that the COSS provides sufficiently unbiased use among males and females. Putnick and Bornstein (2016) suggest that scalar measurement invariance tests are dynamic and informative aspects of the functioning of a construct across groups rather than gateway tests. Furthermore, according to the present study results it is reasonable for future studies to investigate gender-based differences in compulsive online shopping by using the COSS.

Moreover, the Persian COSS showed an acceptable internal consistency for all factors, and the total score using Cronbach's alpha (ranges from 0.74 to 0.94). These findings are in accordance with the Italian COSS which showed good indications of internal consistency (Gori et al., 2022). The outcomes of the present study also highlighted that the Persian COSS has a multidimensional structure and good internal consistency comparable to the proposed structure in the original English version (Manchiraju et al., 2017), as well as other translated versions in non-English countries such as Italian (Gori et al, 2022) and Malaysian (Chuah et al, 2018).

The current findings also support the convergent validity of the Persian COSS. Problematic internet use predicted 3.8 % of the variance in COSS scores independently of other factors. According to the hierarchical regression findings, age, gender, income, and time spent on the internet/day, were not significant predictors of COSS scores. However, with regards to gender, previous studies reported different findings

**Table 5**  
Bivariate correlations between the COSS subscales and the study variables (n = 802).

	Salience	Mood modification	Conflict	Tolerance	Relapse	Withdrawal	Problems
Age	-0.02	-0.09**	0.00	-0.02	0.05	-0.06	0.00
Gender <sup>1</sup>	-0.07*	-0.12**	0.03	-0.03	-0.02	-0.05	0.00
Time spent on the internet/day	0.14**	0.13**	0.09*	0.12**	0.02	0.12**	0.06
Online buying frequency	0.35***	0.31***	0.15***	0.38***	0.22***	0.26***	0.20***
Internalized symptoms <sup>2</sup>	0.13***	0.18***	0.11***	0.13***	0.11***	0.19***	0.17***
Loneliness	0.07*	0.12**	0.07*	0.04	0.07*	0.11**	0.10**
Impulsivity	0.12***	0.10**	0.09**	0.09**	0.09**	0.11***	0.14**
Obsession	0.12***	0.15***	0.11***	0.12***	0.12***	0.19***	0.18***
Problematic internet use	0.20***	0.22***	0.15***	0.22***	0.15***	0.28***	0.20**

Note. N = 802. Each value in the table are correlation estimates (r). <sup>1</sup>Coded as: 1 = Males, 2 = Females. <sup>2</sup>Scores from DASS-21. Level of significance: \*\*\*p < .001.

(Manchiraju et al., 2017; Rose & Dhandayudham., 2014). Thus, the findings of the present study indicate that the COSS is not sensitive to gender and age among Iranian adults. On the other hand, education exhibited a weak association with COSS after adding internalized symptoms, impulsivity, and obsession to the regression model in the second step. The most powerful demographic predictor of the COSS was online buying frequency.

Previous studies have indicated that compulsive online shopping and problematic internet use are separate, but highly correlated, constructs (Müller et al., 2021; Montag et al., 2015). Therefore, the findings of the present study support the convergent validity of the Persian COSS as problematic internet use significantly predicted COSS scores.

The current findings also support the concurrent validity of the Persian COSS. In agreement with previous studies which indicated similar relationships, COSS scores exhibited positive and significant associations with loneliness (Luo et al., 2018; Harnish et al., 2019), impulsivity (Brunelle & Grossman, 2022), obsession (He et al., 2018;

**Table 6**  
Hierarchical regression analysis results.

	B	t	R <sup>2</sup>
<b>Step 1</b>			<b>0.144***</b>
Age	-0.047	-1.365***	
Gender	-0.041	-1.215	
Education	0.056	1.662	
Income	-0.036	-1.063	
Time spent on the internet/day	0.072	2.136*	
Online buying frequency	0.355	10.445***	
			<b>0.188***</b>
<b>Step 2</b>			
Age	-0.007	-0.195	
Gender	-0.012	-0.362	
Education	0.067	2.038*	
Income	-0.027	-0.806	
Time spent on the internet/day	0.024	0.701	
Online buying frequency	0.37	11.118***	
Internalized symptoms	0.1	2.089*	
Loneliness	-0.005	-0.133	
Impulsivity	0.051	1.322	
Obsession	0.122	2.969**	
			<b>0.225***</b>
<b>Step 3</b>			
Age	0.004	0/121	
Gender	-0.026	-0/796	
Education	0.079	2/452**	
Income	-0.024	-0/747	
Time spent on the internet/day	-0.042	-1/19	
Online buying frequency	0.377	11/574***	
Internalized symptoms	0.067	1/421	
Loneliness	-0.045	-1/137	
Impulsivity	0.001	0/028	
Obsession	0.091	2/235	
Problematic internet use	0.244	6/105***	

Note:  $\beta$  = standardized regression coefficient; \*\*\* p < .001; \*\* p < .01; \* p < .05. n = 802.



Gori et al., 2022), internalized symptoms (Claes et al., 2016; Wang et al., 2022), and problematic internet use (Mueller et al., 2011b; Suresh & Biswas, 2020). Also, as expected, COSS scores were associated with online shopping during the past year. As a result, this study provides evidence of the correspondence of the COSS and variables which have been linked to compulsive online shopping in previous studies.

The present study suffers from a number of limitations. First, using self-report measures might cause response biases. Second, the sample used in the present study was gathered using a convenience method. Third, the design of the study was cross-sectional, so causal inferences cannot be made. Fourth, some of the scales used in the present study were not validated in Persian language. Despite these limitations the findings of the present study have significance and novelty in several ways: (i) the Persian COSS appears to be a valid measure to assess compulsive online shopping among Iranians; (ii) the Persian COSS gender invariance results present a reasonable possibility for the future studies to investigate gender-based factors in compulsive online shopping using; and (iii) The Persian COSS gender and compulsive online shopping subscales (except mood modification and salience) were not significantly correlated. This weak relationship is a surprising finding according to previous studies. It certainly needs more investigation. The present study could provide insights into helping identify people who are vulnerable to compulsive online shopping. Consequently, specialized prevention programs as well as treatment programs could be accelerated for people who are vulnerable to compulsive online shopping. Furthermore, future studies can investigate the validity of the COSS in other cultural contexts. Meanwhile, future studies can discriminate the compulsive online shopping and compulsive traditional face to face shopping to further explore the differences and similarities between these two phenomena.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Data availability

Data will be made available on request.

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