

# Psychometric Properties of the Turkish Version of the Belief About Losing Control Inventory: Testing the Measurement Invariance Across Gender

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## ABSTRACT

Recent studies suggest that beliefs regarding losing control may have a pivotal role in the formulation of anxiety-related problems. The Beliefs About Losing Control Inventory (BALCI) is a self-report measure that is employed to assess thought control failure. The BALCI comprises 21 items and three subscales. This study aimed to investigate the psychometric properties and measurement invariance across gender groups of the Turkish version of the BALCI. The BALCI, Obsessive Belief Questionnaire-44 (OBQ-44), Vancouver Obsessional Compulsive Index (VOCI), Anxiety Sensitivity Index-3 (ASI-3), and State-Trait Anxiety Inventory-Trait Version (STAI-T) were administered to 531 volunteer undergraduates. Confirmatory factor analysis replicated the original 21-item three-factor structure of the BALCI. Internal consistency of the BALCI total and subscales were adequate. Retest reliability for the total scores of the BALCI was .76, for the subscales varying from 0.72 to 0.78. The BALCI scores significantly correlated with OBQ-44, ASI-3, and STAI-T. The BALCI and subscales also explained a significant amount of variance in OCD symptoms above and beyond obsessive beliefs. This study also provided evidence of the measurement invariance of the BALCI across gender groups. In conclusion, the Turkish version of the BALCI is a valid and reliable instrument to assess negative beliefs regarding losing control.

**Keywords:** Assessment, beliefs, losing control, obsessive-compulsive disorder.

## ÖZ

### Kontrol Kaybı İnançları Envanteri'nin (BALCI) Türkçe Versiyonunun Psikometrik Özellikleri: Cinsiyetler Arası Ölçüm Değişmezliğinin Test Edilmesi

Güncel çalışmalar, kontrol kaybı hakkındaki inançların, anksiyete ile ilişkili problemlerin oluşumunda merkezi bir rol oynayabileceğini öne sürmektedir. Kontrol Kaybı İnançları Envanteri [Belief About Losing Control Inventory (BALCI)], kontrol başarısızlığı düşüncelerini değerlendirmek için kullanılan bir öz bildirim ölçüm aracıdır. BALCI, 21 madde ve üç alt ölçekten oluşmaktadır. Bu çalışma, BALCI'nın Türkçe versiyonunun psikometrik özelliklerini ve cinsiyet grupları arasındaki ölçüm değişmezliğini incelemeyi amaçlamaktadır. BALCI'nın psikometrik özelliklerini belirlemek için, Obsesif İnançlar Anketi-44 (OBQ-44), Vancouver Obsesif Kompulsif İndeksi (VOCI), Anksiyete Duyarlılığı İndeksi-3 (ASI-3) ve Durumluk-Sürekli Kaygı Envanteri-Sürekli Form (STAI-T) ile 531 gönüllü üniversite öğrencisinden veri toplandı. Doğrulayıcı faktör analizi, BALCI'nın orijinal 21 maddelik üç faktör yapısını tekrarladı. BALCI'nın toplam ve alt ölçeklerinin iç tutarlılığı yeterli bulunmuştur. BALCI'nın güvenilirlik çalışması için test-tekerrar test uygulamasında toplam puanları için 0,76, alt ölçekler için ise 0,72'den 0,78'e değiştiği görüldü. BALCI puanları OBQ-44, ASI-3 ve STAI-T ile anlamlı düzeyde korele bulundu. BALCI ve alt ölçekler, takıntılı inançların ötesinde, OKB semptomları üzerinde anlamlı bir varyans miktarını da açıklamaktadır. Bu çalışma, ayrıca BALCI'nın cinsiyet grupları arası ölçüm değişmezliğine dair kanıtlar sunmuştur. Sonuç olarak, BALCI'nın Türkçe versiyonunun, kontrol kaybı hakkındaki olumsuz inançları değerlendirmede geçerli ve güvenilir bir araç olduğu sonucuna varıldı.

**Anahtar Kelimeler:** Değerlendirme, inançlar, kontrol kaybı, obsesif kompulsif bozukluk.



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## INTRODUCTION

Recurrent and unwanted intrusive thoughts, images, or urges (i.e., obsessions) and/or repetitive behavior and mental acts (i.e., compulsions) are two main diagnostic components of obsessive–compulsive disorder (OCD) (American Psychiatric Association, 2013). Although intrusive thoughts have a significant role in OCD, research has constantly revealed that these thoughts are commonplace in the general population (Rachman & de Silva, 1978; Radomsky et al., 2014). However, the cognitive behavior model of OCD proposes that individuals with OCD have maladaptive beliefs that include misinterpretation of intrusive thoughts as catastrophic, overly meaningful, and significant. Consequently, these maladaptive beliefs lead them to experience negative emotions and to engage in compulsive behaviors to decrease anxiety and prevent expected negative consequences (Radomsky et al., 2014; Salkovskis, 1999). Therefore, the cognitive–behavior model shows that maladaptive beliefs have an important role in the formation and development of OCD.

In favor of the cognitive–behavioral model of OCD, previous studies consistently reported that maladaptive beliefs predicted OCD symptoms (e.g., Nance et al., 2018). Furthermore, clinical trials focusing on the mechanism of maladaptive beliefs also showed that changing of maladaptive beliefs contributes to a decrease in OCD symptoms (e.g., Diedrich et al., 2016; Wilhelm et al., 2015). Maladaptive beliefs in OCD have been classified using the Obsessive Beliefs Questionnaire (OBQ-44) in three main domains, namely, beliefs about responsibility and threat overestimation, perfectionism and intolerance of uncertainty, and beliefs about importance and need to control thoughts (Obsessive Compulsive Cognitions Working Group, 1997).

Clark and Purdon (1993) proposed that the belief that one must control the thoughts to prevent negative consequences and to decrease stress is one of the features that characterizes people with OCD. Psychometric studies have supported this theory by indicating that metacognitive beliefs about the importance of and control over thoughts predicted obsessive–compulsive symptoms (e.g., Hansmeier et al., 2016). Control thoughts were also correlated with the frequency of happening and emotional intensity of intrusions (Clark & Purdon, 1993). However, Taylor et al. (2006) revealed that a substantial part of individuals with OCD share the same scores on the OBQ-44 as the community sample.

Radomsky and Gagné (2020) proposed that the distinction between beliefs about control, and beliefs regarding losing control is a key for further explorations of OCD. Likewise, Clark (2004) explained that individuals with OCD misinterpret the thought control failure as catastrophic. For instance, thought control failure may be an indicator of a weak or vulnerable

personality or may result in a complete loss of control over their thoughts, emotions, and behaviors. Supporting this idea, OCCWG (1997) proposed that individuals with OCD may have a belief that thought control is essential to prevent negative outcomes. Therefore, negative beliefs about the probability, outcomes, and severity of losing control might be a central element of control-related cognitions in OCD. Furthermore, an experimental study showed the causal relationship between beliefs about losing control and checking behavior (Gagné & Radomsky, 2017). In this experiment, after a bogus EEG recording session, undergraduate students were led to believe that they were at either greater or lower risk of losing control over their thoughts and behaviors when compared to the normative sample. Undergraduates with heightened belief about losing control exhibited more checking behaviors during a computer task. Another experimental study revealed that participants with higher (versus lower) beliefs regarding losing control experienced significantly increased anxiety during the behavioral approach test and perceived themselves as less cautious (Gagné & Radomsky, 2020). Beliefs about losing control may have a role not only in OCD but also in the development of social anxiety. In a recent experimental study, individuals in the high beliefs about losing control condition reported greater anxiety before a social interaction task, and they had worse social performance and more perceived loss of control than did those in the low loss of control condition (Kelly–Turner & Radomsky, 2020).

Supporting this idea, Radomsky and Gagné (2020) developed a measure, the Belief About Losing Control Inventory (BALCI), to assess negative beliefs about losing control over one's thoughts, behavior, emotions, and bodily functions. The BALCI comprises three factors and 21 items rated on a five-point Likert-type scale from 0 ("Not at all") to 5 ("Very much"). Thoughts/Behaviors/Emotions (TBE), the first factor of BALCI, consists of 14 items measuring the beliefs about loss of control over one's thoughts, behaviors, and emotions. The second factor, called the Importance of Staying in Control (ISC), comprises three items focusing on the beliefs about the importance of staying in control. The last factor, Body and Bodily Functions (BBF), includes four items related to the consequences and fear of losing control over one's body/bodily functions. The BALCI had good internal consistency and adequate retest reliability, which demonstrates that it is a reliable and valid tool to measure the beliefs regarding losing control. The BALCI was found to have a strong correlation with obsessive beliefs, anxiety sensitivity, and perceived sense of control over anxiety-provoking situations. Furthermore, compared to other domains of obsessive beliefs, the BALCI predicted a significant amount of variance in OCD symptoms. Consequently, Radomsky and Gagné's (2020) revealed that the BALCI is a reliable and valid scale to measure negative beliefs about losing control and these beliefs may have a pivotal role in OCD.

Negative beliefs about losing control, as shown by previous studies, may have a role in the development and maintenance of OCD and anxiety-related disorders. These studies also provided further evidence that negative beliefs about losing control may require to be included in the formulation of OCD and anxiety-related problems. Furthermore, because monitoring changes in dysfunctional behaviors and beliefs is a core component of psychotherapy (Lambert et al., 2002), a significant decrease in beliefs about losing control may be an important treatment target in cognitive-behavioral therapy for OCD or anxiety-related problems (Radomsky & Gagné, 2020). Conversely, BALCI is a valid and reliable measure to assess beliefs about losing control over one's thoughts, emotions, behaviors, and bodily functions. Thus, this study aims to assess the reliability and validity of the Turkish version of the BALCI. Moreover, past research has shown that gender plays a crucial role in the diversity of symptoms and biological characteristics of OCD (Lochner et al., 2004; Mathes et al., 2019). Gender differences were also observed in metacognitive beliefs, specifically in control thoughts (Esbjörn et al., 2013; O'Carroll & Fisher, 2013; Spada et al., 2008). Considering these findings, it may be suggested that examining whether the constructs as operationalized by the BALCI differ across gender is important in evaluating and treating obsessive-compulsive and anxiety-related disorders. Thus, we also planned to evaluate the measurement invariance of the BALCI across gender groups.

## METHOD

### Participants

Through classroom announcements in two universities, 548 undergraduate students were recruited using a convenient sampling method, which was selected owing to its cost-effectiveness, accessibility to participants, efficient data collection, and ease of implementation. From all analyses, 17 participants with incomplete response sets were excluded. The final sample comprises 531 undergraduate students (373 females, 70.2%; 158 males, 29.2%) ranging in age from 17 to 30 years ( $M=20.93$ ,  $SD=1.81$ ). The aim and procedures of the study were briefly described to all participants before they provided their informed consent. Furthermore, the local ethical committee of the university approved the purposes and procedures of the study.

### Measures

#### Belief About Losing Control Inventory (BALCI)

The BALCI was developed by Radomsky and Gagné (2020), which was aimed at assessing beliefs about losing control over one's thoughts, emotions, behaviors, and bodily functions. It comprises 21 self-report items, rated five-point Likert-type scale from 0 ("Not at all") to 5 ("Very much"). Higher scores indicate higher levels of beliefs about losing

control. The BALCI includes three factors: TBE, ISC, and BBF. Internal consistencies in the present study for the total score and subscales were 0.89, 0.90, 0.71, and 0.57 (Appendix 1).

#### Obsessive Belief Questionnaire-44 (OBQ-44)

The OBQ-44 is a 44-item self-report measure that evaluates belief domains related to OCD (Obsessive Compulsive Cognitions Working Group, 2005). The items are rated on a seven-point scale from 1 ("Disagree very much") to 7 ("Agree very much"). The OBQ-44 comprises three sub-factors: responsibility/threat overestimation, perfectionism/intolerance for uncertainty, and importance of/control over thoughts. The Turkish version of the OBQ-44, adapted by Boysan et al. (2010), has the original factor structure and good internal reliability. In the present study, Cronbach's  $\alpha$ s for the total OBQ-44 and each subscale were 0.93, 0.84, 0.86, and 0.80.

#### Vancouver Obsessive Compulsive Index (VOCI)

The VOCI is a 55-item self-report instrument developed by Thordarson et al. (2004) as a measure of OCD symptomology. The VOCI consists of six subscales: contamination, checking, obsessions, hoarding, "just right," and indecisiveness. The respondents are asked to rate the items on a five-point Likert-type scale from 0 ("Not at all") to 4 ("Very much"). Boysan et al. (2015) reported that the Turkish version of the VOCI with the original six-factor structure yielded high internal reliability. In this sample, the Turkish version of the VOCI revealed good internal consistency with a Cronbach's  $\alpha$  of 0.97 for the total score and for subscales they ranged from 0.80 to 0.89.

#### Anxiety Sensitivity Index-3 (ASI-3)

The ASI-3 is an 18-item self-report questionnaire of anxiety sensitivity. Participants are asked to state their degree of agreement for each item on a five-point Likert-type scale from 0 ("Very little") to 4 ("Very much"). It comprises three subscales: physical, cognitive, and social (Taylor et al., 2007). The Turkish version of the ASI-3, adapted by Mantar (2008), has an original three-factor structure and revealed acceptable internal reliability. In the present study, the Turkish version of the ASI-3 has good internal reliability, with high Cronbach's  $\alpha$ s for total ASI-3 ( $\alpha=0.91$ ), physical ( $\alpha=0.83$ ), cognitive ( $\alpha=0.85$ ), and social ( $\alpha=0.77$ ).

#### State-Trait Anxiety Inventory-Trait Version (STAI-T)

STAI was developed to measure separate dimensions of "state" anxiety or "trait" anxiety (Spielberger, 2010). In the present study, we used the trait version of the STAI. STAI-T was designed to assess a stable tendency to experience anxiety against stressful situations. It consists of 20 self-report items, rating on a four-point Likert-type scale from 1 ("Never") to 4 ("Always"). The Turkish version of the STAI was

adapted by Öner and LeCompte (1985). In the present study, Cronbach's  $\alpha$  for the STAI-T was 0.86.

### Data Analysis

We used SPSS 24 (IBM Corporation, 2015) and Mplus 8.4 (Muthén & Muthén, 1998–2012) for the statistical analysis including six steps: (i) calculating demographic statistics, skewness, and kurtosis values for the sample, (ii) assessment the construct validity of the BALCI by conducting confirmatory factor analysis (CFA), (iii) testing the reliability calculating Cronbach's  $\alpha$  and retest reliability with a time interval of 2 weeks, (iv) calculating corrected item total correlation and item discrimination index, (v) evaluating convergent validity performing the Pearson moment product correlation analysis between the BALCI and relevant measures, and (vi) examining measurement invariance performing several multi-group confirmatory factor analysis.

Skewness and kurtosis values were calculated less than  $\pm 1$ , which met Tabachnick and Fidell's (2007) criteria. For construct validity, a confirmatory factor analysis was performed using maximum likelihood estimation with robust standard errors (Satorra & Bentler, 1994). The following commonly used fit indices (Brown, 2015; Kline, 2011) and acceptable ranges were used to evaluate model fit: the comparative fit index (CFI) ( $\geq 0.90$ ), the Tucker–Lewis index (TLI) ( $\geq 0.90$ ), and the root mean square error of approximation (RMSEA) ( $\leq 0.08$ ) with a 90% CI (Hu & Bentler, 1999; Tabachnick & Fidell, 2007).

To evaluate measurement invariance across gender groups, we run several multi-group CFA to test the configural, metric, and scalar invariance of the BALCI (Li et al., 2015; Vandenberg, 2002). First, to examine the configural invariance, the three-factor structure of the BALCI was freely estimated for female and male students. Then, in the metric invariance, factor loadings of the items of the BALCI were constrained to be equal across groups. Lastly, intercepts and factor loading were set to be equal across groups to examine scalar invariance. A  $\chi^2$  difference test ( $p > 0.05$ ) and recommended change in fit indices ( $\Delta CFI \leq 0.010$ ;  $\Delta TLI \leq 0.010$ ;  $\Delta RMSEA \leq 0.015$ ) were used to model comparison (Chen, 2007; Cheung & Rensvold, 2002).

### Procedure

The BALCI was translated by the authors into Turkish version once permission to translate and use the BALCI was obtained from the copyright owner. Then, the translation was reviewed by three bilingual experts in the English Department and two experts in psychology to evaluate the clarity, comprehensiveness, and relevance of the BALCI. After receiving the experts' opinions, the final form of the Turkish version of the BALCI was obtained. The study was

announced in class, and volunteers filled the questionnaires after their lectures in their classrooms.

## RESULTS

### Linguistic Validity

To evaluate the linguistic validity of the BALCI, we applied the English version, which is the original version of the BALCI to 38 senior students in the Department of English Language Teaching. Then, in a 2-week interval, the Turkish version of the BALCI was presented to the students. We performed Pearson correlation analysis and found that the correlation coefficient between the English and Turkish versions of the BALCI was 0.65 ( $p < 0.001$ ).

### Descriptive Statistics

As a preliminary analysis, we calculated means and standard deviations for each item of the BALCI. The means of the BALCI's items varied from 0.563 (Item 20 "If I lost control, I would throw up") to 3.124 (Item 14 "It's important for me to stay in control of my thoughts"). Standard deviations of the BALCI's items fell between 1.004 and 1.420. Table 1 shows the means and standard deviations. Moreover, Table 1 presents descriptive statistics for other analyses.

### Construct Validity

A second-order CFA was performed in order to investigate the three-dimensional latent structure of the BALCI. The second-order CFA results indicated that the original three-factor model of the BALCI did not fit the data well. Goodness-of-fit indices for the CFA model were as follows:  $\chi^2 = 518,044$ ,  $df = 186$ ,  $CFI = 0.89$ ,  $TLI = 0.88$ ,  $RMSEA = 0.058$  [90% CI 0.052 to 0.064], and  $SRMR = 0.056$ . Modification indices suggested a possible covariance between the error variances of the indicator variable pairs of I17–I18, I4–I8, and I1–I9. Since these items in each pair are semantically close and located in the same sub-dimension, a covariance between the error variance of two items in each pair was added to the model, and the CFA was performed again. The last CFA results showed that the model fit the data well with the goodness-of-fit indices as follows:  $\chi^2 = 461,594$ ,  $df = 183$ ,  $CFI = 0.91$ ,  $TLI = 0.90$ ,  $RMSEA = 0.054$  [90% CI 0.047 to 0.060],  $SRMR = 0.055$ . In Table 2, all items of the BALCI loaded significantly onto the respective latent factors, and three sub-factors loaded strongly onto the general factor. Moreover, three sub-factors significantly correlated with each other and the second-order latent factor of BALCI.

Furthermore, to compare the three-dimensional latent structure of the BALCI with the unidimensional latent structure of the BALCI, we ran two additional CFAs, one of which is for the unidimensional latent structure of the BALCI and the other one is a first-order CFA for the three-dimensional latent structure of the BALCI. In Table 3, the CFA results revealed that



**Table 1.** Means, standard deviations, and corrected item-total correlations of the BALCI

Item	Mean	SD	Total-CITC	TBE-CITC	ISC-CITC	BBF-CITC	t
Item 1	1.593	1.066	0.407	<b>0.423</b>			-10.727*
Item 2	1.077	1.139	0.537	<b>0.603</b>			-14.328*
Item 3	1.896	1.132	0.570	<b>0.591</b>			-16.800*
Item 4	1.252	1.225	0.604	<b>0.615</b>			-16.965*
Item 5	1.496	1.191	0.526	<b>0.519</b>			-15.527*
Item 8	1.519	1.236	0.676	<b>0.681</b>			-13.757*
Item 9	1.551	1.183	0.616	<b>0.644</b>			-9.440*
Item 10	1.444	1.234	0.545	<b>0.518</b>			-21.039*
Item 11	1.582	1.134	0.633	<b>0.659</b>			-19.154*
Item 12	1.316	1.175	0.685	<b>0.702</b>			-14.579*
Item 13	1.271	1.217	0.535	<b>0.570</b>			-17.836*
Item 16	1.510	1.198	0.664	<b>0.664</b>			-21.118*
Item 17	1.574	1.190	0.656	<b>0.642</b>			-15.782*
Item 18	1.318	1.158	0.560	<b>0.555</b>			-4.955*
Item 14	3.124	1.067	0.168		<b>0.555</b>		-5.554*
Item 15	2.825	1.149	0.183		<b>0.536</b>		-18.645*
Item 19	2.673	1.227	0.309		<b>0.468</b>		-20.976*
Item 6	1.051	1.247	0.492			<b>0.497</b>	-15.048*
Item 7	0.771	1.110	0.339			<b>0.332</b>	-8.147*
Item 20	0.563	1.004	0.204			<b>0.244</b>	-6.050*
Item 21	1.601	1.420	0.521			<b>0.345</b>	-15.542*
Cronbach's $\alpha$			0.89	0.90	0.71	0.57	

\*:  $P < 0.01$ . BALCI: Beliefs About Losing Control Inventory; SD: Standard deviation; CITC: Corrected item total correlation; TBE: Thoughts/Behaviors/Emotions; ISC: Importance of Staying in Control; BBF: Body and bodily functions.

the unidimensional latent structure of the BALCI did not fit the data ( $\chi^2=705.016$ ,  $df=186$ ,  $CFI=0.83$ ,  $TLI=0.81$ ,  $RMSEA=0.072$  [90% CI 0.067 to 0.078],  $SRMR=0.068$ ). Conversely, the first- and second-order CFA showed that the original three-factor latent structure of the BALCI fit the data well.

### Internal Consistency

To examine internal reliability, we calculated Cronbach's  $\alpha$  internal coefficient. The total BALCI ( $\alpha=0.89$ ) and TBE subscale ( $\alpha=0.90$ ) yielded excellent internal reliability. Although the ISC subscale had good internal consistency, the BBF subscale demonstrated fair internal consistency, with Cronbach's  $\alpha$ s of 0.71 and 0.57, respectively.

### Retest Reliability

With an interval of approximately 2 weeks, we administered the BALCI to 42 participants a second time. To assess retest reliability, we calculated zero-order correlations between the scores of the first and second administrations. The

correlation coefficients for the total BALCI ( $r=0.76$ ), TBE ( $r=0.72$ ), ISC ( $r=0.78$ ), and BBF ( $r=0.78$ ) were acceptable.

### Item Total Correlation and Item Discrimination

We also calculated the correlation coefficient between item scores and the total score of the BALCI. Item-total correlations for the whole BALCI ranged from 0.17 to 0.69. Item-total correlation coefficients varied from 0.42 to 0.70 for TBE, 0.47 to 0.55 for ISC, and 0.24 to 0.50 for BBF. Table 1 presents the item-total correlation coefficients for each item.

To examine how each item discriminates between individuals, we determined the lower 27% and upper 27% of participants having the highest and lowest scores in rank order respectively on the BALCI's total score. Then, we performed an independent t-test on the groups to define whether there was a significant difference between groups on item scores. It demonstrated that the upper 27% group had significantly higher scores on all items than the lower 27% group. Table 1 presents the independent t-test results.

**Table 2.** Results of confirmatory factor analysis on the BALCI

Factor	Item	Estimate	Standardized estimate	Standard error	Critical value	95% CI		p
						Lower	Upper	
TBE	Item 1	1.000	0.425	0.040	10.761	0.348	0.503	0.000
	Item 2	1.563	0.622	0.031	20.282	0.562	0.682	0.000
	Item 3	1.537	0.616	0.030	20.753	0.558	0.674	0.000
	Item 4	1.697	0.628	0.030	20.944	0.569	0.687	0.000
	Item 5	1.460	0.556	0.030	18.670	0.498	0.615	0.000
	Item 8	1.942	0.713	0.026	27.440	0.662	0.764	0.000
	Item 9	1.742	0.668	0.028	23.587	0.613	0.724	0.000
	Item 10	1.542	0.567	0.033	17.386	0.503	0.631	0.000
	Item 11	1.752	0.700	0.025	27.593	0.650	0.750	0.000
	Item 12	1.946	0.751	0.024	30.934	0.703	0.798	0.000
	Item 13	1.635	0.609	0.034	18.113	0.543	0.675	0.000
	Item 16	1.855	0.702	0.026	27.067	0.651	0.753	0.000
	Item 17	1.762	0.671	0.027	24.474	0.618	0.725	0.000
	Item 18	1.479	0.579	0.034	17.242	0.513	0.645	0.000
ISC	Item 14	1.000	0.718	0.042	17.035	0.635	0.801	0.000
	Item 15	1.045	0.697	0.043	16.381	0.613	0.780	0.000
	Item 19	0.948	0.591	0.043	13.804	0.508	0.675	0.000
BBF	Item 6	1.000	0.648	0.035	18.554	0.580	0.717	0.000
	Item 7	0.605	0.440	0.043	10.315	0.357	0.524	0.000
	Item 20	0.368	0.296	0.057	6.297	0.204	0.388	0.000
	Item 21	1.075	0.611	0.038	16.189	0.537	0.685	0.000
BALCI	TBE	1.000	0.925	0.100	9.295	0.730	1.120	0.000
	ISC	0.427	0.234	0.056	4.185	0.124	0.343	0.000
	BBF	1.626	0.844	0.091	9.296	0.666	1.022	0.000

BALCI: Beliefs About Losing Control Inventory; CI: Confidence interval; TBE: Thoughts/Behaviors/Emotions; ISC: Importance of Staying in Control; BBF: Body and bodily functions.

### Convergent Validity

We performed a Pearson correlation analysis between the BALCI and relevant measures to examine the convergent validity of the BALCI. Table 4 presents the correlation coefficients between the BALCI (total and subscales) and other measures. The correlations between the BALCI scores, and OBQ-44, ASI-3, and STAI-T scores were investigated to assess the convergent validity of the BALCI. The BALCI total score had a significant large correlation with the ASI-3 total score ( $r=0.559$ ,  $p<0.001$ ), and there are moderate correlations between the BALCI total score and OBQ-44 ( $r=0.455$ ,  $p<0.001$ ) and STAI-T ( $r=0.412$ ,  $p<0.001$ ). Since significant correlation represents convergent

validity (Hinkin, 1998), it can be concluded that the Turkish version of the BALCI had convergent validity.

### Predictive Validity

To explore whether beliefs about losing control contribute to OCD symptoms after controlling obsessive beliefs, we carried out hierarchical logistic regression analyses. As shown in Table 5, at the first step in regression analysis, OBQ-44 total scores were regressed on a binary dependent variable (VOCI total scores of  $\geq 87.5$  vs. VOCI total scores of  $< 87.5$ ) and explained a significant amount of variance,  $R^2=0.23$ . At step 2, we added the BALCI total score to the model and the amount of variance explained significantly increased,

**Table 3.** CFA for the unidimensional and original three-dimensional latent structure of BALCI

	$\chi^2$	df	$\chi^2/SD$	RMSEA	CFI	TLI	SRMR
General one factor	705.016	186	3.790	0.072	0.83	0.81	0.068
Three factors/first order	461.594	183	2.522	0.054	0.91	0.90	0.055
Three factors/second order	461.594	183	2.522	0.054	0.91	0.90	0.055

CFA: Confirmatory factor analysis; BALCI: Beliefs About Losing Control Inventory; df: Degrees of freedom; SD: Standard deviation; RMSEA: Root mean square error of approximation; CFI: Comparative Fit Index; TLI: Tucker–Lewis Index; SRMR: Standardized root mean square residual.

$R^2=0.30$ . In the final model, both the OBQ-44,  $OR=1.021$  95%  $CI=1.013–1.028$ ,  $p<0.001$ , and the BALCI,  $OR=1.049$  95%  $CI=1.029–1.070$ ,  $p<0.001$ , were significant predictors of a tendency to have obsessive–compulsive symptoms.

Furthermore, to determine the predictive role of subscales of BALCI on obsessive–compulsive symptomology, a second hierarchical regression analysis, in which three subscales of BALCI and the total score of OBQ-44 were assigned as predictor variables, was performed. As shown in Table 5, the results of regression analysis indicated that the model accounted for 36% of the variance. OBQ-44,  $OR=1.025$  95%  $CI=1.017–1.033$ ,  $p<0.001$ ; BALCI-TBE,  $OR=1.049$  95%  $CI=1.018–1.080$ ,  $p<0.01$ ; BALCI-ISC,  $OR=0.839$  95%  $CI=0.761–0.924$ ,  $p<0.001$ ; and the BALCI-BBF,  $OR=1.155$  95%  $CI=1.054–1.267$ ,  $p<0.01$ , significantly predicted the dependent variable.

### Measurement Invariance

The extent to which the three-factor latent structure of the BALCI exhibited measurement invariance between women and men was tested by performing a multi-group CFA. To assess measurement invariance, we began with configural invariance which tests whether the same items measure the same construct across gender groups. In the configural model, the three-dimensional latent structure of BALCI was estimated significantly within each group. As depicted in Table 6, the configural model fit the data well ( $\chi^2=667.612$ ,  $df=366$ ,  $CFI=0.91$ ,  $TLI=0.90$ ,  $RMSEA=0.056$  [90%  $CI$  0.049 to 0.062],  $SRMR=0.064$ ). This result demonstrated that the three-factor model has a good model fit across women and men. After obtaining configural invariance, the equality of unstandardized factor loadings between men and women was tested in a metric model, which demonstrated a good model fit ( $\chi^2=688.135$ ,  $df=384$ ,  $CFI=0.91$ ,  $TLI=0.90$ ,  $RMSEA=0.055$  [90%  $CI$  0.048 to 0.061],  $SRMR=0.066$ ). The metric invariance model did not fit significantly worse than the configural invariance model; the  $\chi^2$  difference test was non-significant, and no significant changes in model fit indices occurred;  $p(\Delta\chi^2)=0.470$ ,  $\Delta CFI=0$ ,  $\Delta TLI=0$ ,  $\Delta RMSEA=0.001$ . This result indicated that the construct of the BALCI has the same meaning across women and men. To justify mean comparisons across gender groups, scalar invariance in which

all unstandardized factor loadings and item thresholds were constrained equally across gender groups. The scalar invariance model also fit well ( $\chi^2=710.981$ ,  $df=402$ ,  $CFI=0.91$ ,  $TLI=0.90$ ,  $RMSEA=0.054$  [90%  $CI$  0.047 to 0.060],  $SRMR=0.067$ ) and did not result in a significant decrease in fit relative to the metric model ( $p(\Delta\chi^2)=0.273$ ,  $\Delta CFI=0.0$ ,  $\Delta TLI=0$ ,  $\Delta RMSEA=0$ ). This indicated that the item intercepts were invariant across women and men. Since item intercepts are considered the origin of the scale, the scalar invariance showed that participants who have the same value on the latent construct should have equal values on the items the construct is based. In summary, these analyses revealed that measurement invariance was obtained across women and men—that is, the relationships of the item to the latent factors of the BALCI were equivalent between women and men.

### DISCUSSION

The present study aimed to assess the factor structure and psychometric properties of the Turkish version of the BALCI developed by Radomsky and Gagné (2020). Our findings support the reliability and validity of the Turkish version of the BALCI and reveal that the Turkish version of the BALCI has the original 21-item three-factor structure (TBE, ISC, and BBF). The internal consistency and retest validity were good. As in Radomsky and Gagné's (2020) study, we assessed the criterion validity of the BALCI by calculating the correlation between the BALCI and OBQ-44, ASI-3, and STAI-T. We found that the BALCI significantly correlated with obsessive beliefs (OBQ-44), anxiety sensitivity (ASI-3), and trait anxiety (STAI-T). The Turkish version of the BALCI was further demonstrated to have adequate retest reliability and internal consistency, indicating that the Turkish version of the BALCI is a reliable and valid instrument to assess beliefs about losing control.

Several studies showed that control-related cognitions are one of the diagnostic features of OCD (e.g., Clark & Purdon, 1993; Hansmeier et al., 2016). Recent studies also proposed that besides the control-related cognitions, beliefs about losing control were associated with OCD and other anxiety disorders (Clark, 2004; Gagné & Radomsky, 2017; Gagné & Radomsky, 2020). Beliefs regarding staying in control and fear of losing control are constructs that can contribute to the persistence

**Table 4.** Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. BALCI-T	-																			
2. TBE	0.963*	-																		
3. ISC	0.380*	0.198*	-																	
4. BBF	0.713*	0.583*	0.116*	-																
5. VOCl-T	0.491*	0.487*	0.006	0.450*	-															
6. CONT	0.352*	0.333*	0.001	0.383*	0.842*	-														
7. CHECK	0.431*	0.436*	-0.001	0.374*	0.838*	0.671*	-													
8. OBS	0.442*	0.437*	0.009	0.409*	0.869*	0.615*	0.744*	-												
9. HRD	0.441*	0.452*	-0.054	0.407*	0.841*	0.640*	0.699*	0.659*	-											
10. JRGHT	0.482*	0.483*	0.032	0.404*	0.916*	0.744*	0.786*	0.709*	0.784*	-										
11. INDCSV	0.513*	0.528*	0.027	0.391*	0.809*	0.604*	0.662*	0.632*	0.687*	0.786*	-									
12. OBQ-44-T	0.455*	0.425*	0.276*	0.277*	0.515*	0.378*	0.431*	0.441*	0.430*	0.543*	0.502*	-								
13. RTE	0.448*	0.408*	0.299*	0.282*	0.447*	0.318*	0.403*	0.393*	0.371*	0.456*	0.435*	0.913*	-							
14. PC	0.377*	0.357*	0.259*	0.184*	0.439*	0.331*	0.339*	0.334*	0.347*	0.510*	0.441*	0.883*	0.700*	-						
15. ICT	0.383*	0.362*	0.160*	0.279*	0.487*	0.359*	0.410*	0.457*	0.435*	0.474*	0.459*	0.854*	0.710*	0.605*	-					
16. ASI-T	0.559*	0.558*	0.061	0.454*	0.692*	0.561*	0.584*	0.592*	0.615*	0.667*	0.649*	0.501*	0.445*	0.394*	0.504*	-				
17. ASI-P	0.487*	0.468*	0.083	0.432*	0.612*	0.549*	0.516*	0.533*	0.507*	0.561*	0.526*	0.423*	0.383*	0.328*	0.421*	0.888*	-			
18. ASI-C	0.564*	0.573*	0.051	0.433*	0.668*	0.514*	0.569*	0.562*	0.622*	0.665*	0.637*	0.483*	0.440*	0.379*	0.475*	0.901*	0.709*	-		
19. ASI-S	0.429*	0.438*	0.024	0.336*	0.554*	0.421*	0.464*	0.473*	0.502*	0.544*	0.560*	0.423*	0.357*	0.337*	0.443*	0.865*	0.634*	0.678*	-	
20. STAI-T	0.412*	0.447*	0.013	0.241*	0.512*	0.370*	0.452*	0.433*	0.428*	0.506*	0.571*	0.353*	0.297*	0.318*	0.326*	0.488*	0.419*	0.480*	0.396*	-
Mean	33.01	20.40	8.62	3.99	60.77	15.01	7.43	10.65	6.81	15.86	8.66	165.56	62.51	63.98	39.06	24.34	8.56	7.41	8.36	46.36
SD	13.88	10.98	2.73	3.18	38.66	10.49	6.24	8.83	6.37	9.91	5.43	40.96	16.15	16.80	13.33	14.68	5.74	5.59	5.26	8.96
Skewness	0.429	0.503	-0.73	0.71	0.72	0.65	0.67	0.96	0.93	0.62	0.66	-0.08	-0.10	-0.10	0.24	0.61	0.41	0.69	0.56	0.20
Kurtosis	-0.38	-0.25	0.02	-0.15	-0.16	-0.25	-0.44	0.44	0.05	-0.23	-0.19	0.22	0.16	0.09	-0.41	-0.17	-0.63	-0.26	-0.23	0.17
$\alpha$	0.89	0.90	0.71	0.57	0.97	0.89	0.89	0.90	0.88	0.88	0.80	0.93	0.84	0.86	0.80	0.91	0.83	0.85	0.77	0.86

\*:  $p < 0.01$ . BALCI-T: Beliefs About Losing Control-Total; TBE: Thoughts/Behaviors/Emotions; ISC: Importance of Staying in Control; BBF: Body and bodily functions; VOCl-T: Vancouver Obsessive Compulsive Index-Total; CONT: Contamination; CHECK: Checking; OBS: Obsessions; HRD: Hoarding; JRGHT: Just right; INDCSV: Indecisiveness; OBQ-44-T: Obsessive Belief Questionnaire-44-Total; RTE: Responsibility/threat overestimation; PC: Perfectionism/intolerance for uncertainty; ICT: Importance of Control Over Thoughts; ASI-T: Anxiety Sensitivity Index-Total; ASI-P: Anxiety Sensitivity Index-Physical; ASI-C: Anxiety Sensitivity Index-Cognitive; ASI-S: Anxiety Sensitivity Index-Social; STAI-T: State-Trait Anxiety Inventory-Trait; SD: Standard deviation.



**Table 5.** Logistic regression analyses predicting obsessive–compulsive symptoms (VOCI ≥87.5)

	Model 1				Model 2			
	R <sup>2a</sup>	B	SE	OR (95% CI)	R <sup>2a</sup>	B	SE	OR (95% CI)
	0.23				0.30			
Constant		−5.680	0.643	0.003*		−6.326	0.701	0.002*
OBQ-44		0.026	0.003	1.027 (1.020, 1.034)*		0.021	0.004	1.021 (1.013, 1.028)*
BALCI						0.048	0.010	1.049 (1.029, 1.070)*
	0.23				0.36			
Constant		−5.680	0.643	0.003*		−5.518	0.726	0.004*
OBQ-44		0.026	0.003	1.027 (1.020, 1.034)*		0.024	0.004	1.025 (1.017, 1.033)*
BALCI-TBE						0.047	0.015	1.049 (1.018, 1.080)*
BALCI-ISC						−0.176	0.050	0.839 (0.761, 0.924)*
BALCI-BBF						0.144	0.047	1.155 (1.054, 1.267)*

<sup>a</sup>: Nagelkerke; \*: p<0.001. VOCI: Vancouver Obsessional Compulsive Index; SE: Standard error; OR: Odds ratio; CI: Confidence interval; OBQ-44: Obsessive Belief Questionnaire-44; BALCI: Beliefs About Losing Control Inventory; TBE: Thoughts/Behaviors/Emotions; ISC: Importance of Staying in Control; BBF: Body and bodily functions.

**Table 6.** Fit indices for measurement invariance across gender groups

Model	χ <sup>2</sup>	df	CFI	TLI	RMSEA	SRMR	p (Δχ <sup>2</sup> )	ΔCFI	ΔTLI	ΔRMSEA
Configural	667.612	366	0.91	0.90	0.056	0.062				
Metric	688.135	384	0.91	0.90	0.055	0.066	0.470	0	0	0.001
Scalar	710.981	402	0.91	0.90	0.055	0.067	0.273	0	0	0

The χ<sup>2</sup> difference test was performed by comparing each model with the previous model. df: Degrees of freedom; CFI: Comparative Fit Index; TLI: Tucker–Lewis Index; RMSEA: Root mean square error of approximation; SRMR: Standardized root mean square residual.

of compulsions. Considering the OCD literature on the loss of control (OCCWG, 2005), thoughts are observed to be generally handled with loss of control, and it is one of the most prominent cognitive features of OCD. Fear of losing control, especially over unwanted thoughts, has been repeatedly observed in OCD. This cognitive feature of OCD seems to be consistent with the TBE subscale of the BALCI. Moreover, Salkovskis and Wahl (2003) stated that loss of control can be considered as an indicator of the result of increased responsibility thinking. A person with multiple obsessions may misinterpret their failure to block intrusive thoughts as a sign that they are losing control. From this point of view, the cognition of being in control of OCD supports the ISC subscale of the BALCI. Radomsky and Gagné’s (2020) study provided psychometric evidence that beliefs about losing control are a significant construct related to OCD. The present study also demonstrated that the thought control failure is a valid construct in the Turkish sample.

Recent experimental studies also indicated that thought control failure has a monumental role in the formulation and/or perpetuation of anxiety-related problems. Gagné and Radomsky (2020) conducted an experimental study and found that people with a higher belief in losing control have increased anxiety when they are around objects that are likely to cause harm. Additionally, using BALCI in their study, Kelly–Turner and Radomsky (2020) demonstrated that thought control failure is not only related to OCD but beliefs about losing control may also be related to the cognitive model of social anxiety. Beliefs about losing control may partially explain the changes in the cognitive and behavioral differences in social interactions in social anxiety. However, Gagné, Radomsky, and O’Conner (2021) suggested that negative beliefs about losing control over one’s behavior do not play a role in the development of expectation anxiety and that a phenomenon associated with social anxiety.

In parallel with the original study of the BALCI, hierarchical logistic regression analyses revealed that the Turkish version of the BALCI explained a substantial amount of variance in OCD symptoms besides other areas of obsessive beliefs. Moreover, the BALCI subscales (TBE, BBF, and ISC) predicted a significant amount of variance in obsessive–compulsive symptomatology. This result denotes the predictive validity of the Turkish version of the BALCI, which may distinguish between those with OCD and those without. This result is consistent with Clark's (2019) theory of cognitive control, which claims that failed thought control is taken as evidence that one can lose control over other areas. The present study also supports that thought control failure may need to be employed as a component in the cognitive–behavioral formulation of OCD and other anxiety-related problems. (Radomsky & Gagné, 2020). Recent experimental studies also support this phenomenon, indicating that individuals with heightened beliefs about losing control significantly experienced increasing anxiety, intrusive thoughts, social anxiety, and checking behaviors (Gagné & Radomsky, 2017; Gagné et al., 2021; Gagné & Radomsky, 2020).

Unlike the original study of the BALCI, we assessed the measurement invariance of the three-factor latent structure of BALCI and obtained measurement invariance (configural, metric, and scalar) across genders. This result implies that (i) the same items measure the construct of the BALCI across men and women, (ii) the construct of the BALCI has the same meaning to men and women, and (iii) men and women have the same expected item response at the same absolute level of the construct of the BALCI. Consequently, this result alludes that the differences in scores accurately reflect differences in the constructs as operationalized by the BALCI rather than gender-based differences.

### Limitations and Future Directions

The study has some limitations. First, we validated the Turkish version of the BALCI using a non-clinical-undergraduate sample that limits the generalizability of the result. Moreover, we employed a non-probabilistic sampling technique in which the sample lacks clear generalizability. Therefore, future studies should examine the psychometric properties of the Turkish version of the BALCI in a clinical sample. Radomsky and Gagné (2020) also reported that some deleted items may represent experiences that are more relevant to the clinical sample. Thus, future studies may validate the BALCI with the deleted items. Second, although we examined the measurement invariance of BALCI across gender groups, the proportion of women was higher than that of men. Therefore, in future studies, the psychometric properties of BALCI can be examined in research groups with a more balanced gender distribution. Third, we examined the measurement invariance of the BALCI across gender groups. Future work should determine whether the three-

factor structure of the BALCI exhibits measurement invariance between non-clinical and clinical samples. Lastly, Gagné et al. (2021) showed that negative beliefs regarding losing control may have an important role in conceptualizing social anxiety and previous studies indicated that fear of losing control is related to other anxiety-related disorders (Chambless et al., 1984). Future research should focus on identifying the role of beliefs about losing control in conceptualizing other anxiety-related disorders.

### CONCLUSION

To our knowledge, the BALCI is the first instrument to measure negative beliefs about losing control, and despite limitations, the present study is the first validation study of the Turkish version of the BALCI. This study provided psychometric evidence that negative beliefs about losing control over one's thoughts, behaviors, emotions, and body/bodily functions are an important cognitive part of OCD symptomatology in Turkish literature. Since beliefs about losing control are associated with obsessive–compulsive symptoms, they may have a vital role in the formulation and perpetuation of OCD and other anxiety-related disorders. The cognitive and behavioral interventions utilized for obsessive–compulsive disorder and other anxiety-related disorders have the objective of monitoring alterations in beliefs regarding losing control. Lambert et al. (2002) conducted a study that revealed that monitoring changes in symptoms and offering patients feedback regarding these changes resulted in improved treatment outcomes. Thus, mental health practitioners may employ the BALCI to identify and assess treatment objectives and results. Moreover, researchers may utilize the BALCI as a tool to gain insight into the cognitive mechanisms that underlie OCD and other anxiety-related disorders. Therefore, the Turkish version of the BALCI seems to be a helpful instrument to determine the changes in negative beliefs in the clinic and assess negative beliefs regarding losing control.

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**Appendix 1.** The Turkish Version of the BALCI

1. Duygularımı kontrol altında tutamamaktan korkuyorum.
2. Eğer çok fazla düşüncem olursa ya da düşüncelerim çok yoğun olursa şuurumu/aklımlı kaybedebilirim.
3. Yođun duygular kontrolünü kaybetmeye neden olacağı için tehlikeli olabilir.
4. Bilincimin kontrolünü kaybetmekten korkuyorum.
5. Eğer zihnimi bir işe odaklayamıyorsam bu kontrolü kaybediyorum demektir.
6. Mesanemin veya bađırsaklarımın kontrolünü kaybetmekten korkuyorum.
7. Durduramayabilirim diye hıçkırık tutmasından veya hapşırılmaktan korkuyorum.
8. Düşüncelerimin kontrolünü kaybetmekten korkuyorum.
9. Duygularımın başa çıkma yeteneđim konusunda endişeliyim.
10. Uygun olmayan ya da utanç verici bir şey yapabilirim diye korkuyorum.
11. Çok üzđün veya endişeli olursam, kontrolümü kaybederim.
12. Yođun duygular kontrolümü kaybettiđimin bir işareti olabilir.
13. Eğer çok duygulanırsam hıç sakinleşemeyeceđim diye endişeleniyorum.
14. Düşüncelerimi kontrol ediyor olmak benim için önemlidir.
15. Kontrolde kalmak benim için önemli bir önceliktir.
16. Duygularımın kontrolünü kaybetme korkusu yaşıyorum.
17. Eğer zihnimdeki düşünceleri, imgeleri ya da dürtüleri yönetemezsem, kontrolü kaybederim.
18. Herhangi bir dürtü veya arzusun kontrolünü kaybedersem, istemesem bile artık ona göre hareket ederim.
19. Duygularımın kontrolden çıkmasını önlemek benim için önemlidir.
20. Eğer kontrolü kaybetseydim, kusardım.
21. Bedenimin ya da beden fonksiyonlarımın kontrolünü kaybetmekten korkuyorum.

BALCI: Beliefs About Losing Control Inventory.

BALCI is available for academic purposes without permission.