

**Cross-cultural Validation and Measurement Invariance of Anxiety and Depression**

**Symptoms: A Study of the Brief Symptom Inventory (BSI) in 42 Countries**

Keywords: Brief Symptom Inventory, Depression, Anxiety, Cross-cultural, Psychometric, Measurement Invariance.

### 1. Introduction

Depression and anxiety are affective disorders characterized by abnormal emotional states. Diagnostic criteria in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; APA, 2013) and the International Classification of Diseases 11<sup>th</sup> Revision (ICD-11; WHO, 2022a) focus on specific symptoms. Depression is characterized by prolonged periods of melancholic feelings of grief or unhappiness, despair, and loss of pleasure or interest in activities for extended periods, whereas anxiety involves feelings of fear, dread, and uneasiness, often accompanied by physical sensations. These disorders are among the most common mental health conditions experienced worldwide, affecting approximately 300 million people globally (Saha et al., 2021; WHO, 2017, 2022b). However, these estimates are unequally distributed across groups of people (Steel et al., 2014).

These common mental disorders (CMD, defined as a range of anxiety and depressive disorders; Lund et al., 2010) may also impact people's lives differently depending on the intersectionality of various attributes and risk factors. Systematic reviews show that low- and middle-income countries experience a higher burden of CMDs, which may lead to multiple socio-economic stressors and challenges, thus perpetuating a vicious cycle (Kessler, 2007; Ridley et al., 2020). Among anxiety and depression vulnerable populations, women (Steel et al., 2014) and sexual/gender minorities (Wittgens et al., 2022) commonly experience depression and anxiety during their lifetime. For instance, once controlling for sociodemographic factors, gay and bisexual males exhibit a significantly higher risk of experiencing depression (OR = 2.91 and 2.41, respectively) in comparison to their heterosexual counterparts (Gonzales & Henning-Smith, 2017). Whereas these relations often replicate across studies, what people experience and express through their symptoms may be influenced by cultural factors (Noguera et al., 2009; Smirnova et al., 2018).

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Cross-cultural and multi-national studies of depression and anxiety using self-report measures show differences across nations, cultures, and ethnicities (see Wiesner et al., 2010). However, it is generally assumed that people experience, express, and understand symptoms the same way across cultures, and that diagnostic/screening tools measure the same latent constructs.

The first assumption may not fully consider how cultural factors influence how people view, think, experience, and express their symptoms, as well as how the context and social norms may modulate or interact with these (Bredström, 2019; Hofmann & Hinton, 2014; Lewis-Fernández et al., 2010). Indeed, studies suggest that different words used as descriptors of symptoms differ in their meanings across languages, thus modulating the diagnosis of depression and anxiety disorders (Noguera et al., 2009; Smirnova et al., 2018). These differences may be diluted, under-recognized, or misidentified through cross-cultural/multi-national studies or even within diverse populations within the same study sample, with potentially serious implications, especially for under-represented populations (Kirmayer, 2001; Kirmayer & Groleau, 2001).

The second assumption, related to measurement invariance (Putnick & Bornstein, 2016), pertains to the capacity of any screening tool to measure—and therefore compare—the same latent construct, reflecting the same meaning (psychometrically speaking) across specific groups or repeated measures. Despite its significance, measurement invariance remains largely overlooked, even in validated instruments routinely administered to measure depression and anxiety symptoms (Akena et al., 2012; Gilbody et al., 2001; Yeung et al., 2020). Several studies and systematic reviews highlight the importance of testing measurement invariance in cross-cultural and multi-national research when using psychometric scales (Gregorich, 2006; Lacko et al., 2022; Stevanovic et al., 2017; Uysal-Bozkir et al., 2013). This may be of particular interest when ascertaining what may be culture-independent or culture-specific dimensions when assessing depression and anxiety (Canino & Alegria, 2008).

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Of many scales available to measure depression or anxiety, fewer have been designed to measure both simultaneously. The Brief Symptom Index (BSI-18) (Derogatis, 1982; Derogatis, 2000) is capable of measuring depression and anxiety symptoms (and somatization), as well as their severity. Whereas several studies have examined this scale's measurement invariance in patient populations (e.g., Hoe & Brekke, 2008; Wang et al., 2010), large cross-cultural assessments of its measurement invariance have not been conducted to date.

This study examined the psychometric properties of the depression and anxiety scores of the BSI-18. Specifically, the study examined the following aims: a) factor structure of the BSI in the entire sample; b) measurement invariance based on language, country, gender, and sexual orientation to ensure meaningful and unbiased subgroup comparisons; c) reliability and validity of the BSI through associations with theoretically relevant correlates; and d) feasibility of using previously established thresholds to identify participants at high risk of depression or anxiety.

## 2. Method

### 2.1. Procedure

The validation of the BSI was conducted within the framework of the “International Sex Survey,”<sup>1</sup> project, a cross-sectional international collaboration involving 42 countries<sup>2</sup>. Details regarding this study and the entire cross-sectional collaboration, such as procedures and eligibility criteria, are described in the project's study protocol (Bóthe et al., 2021) that was also pre-registered (<https://osf.io/csyjq>). The ISS, and therefore this study, was reviewed and approved by each institution's ethics committee board (see OSF registry of ethics approval

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<sup>1</sup> Study website: <https://internationalsexsurvey.org/>

<sup>2</sup> The study protocol paper included Egypt, Iran, Pakistan, and Romania as collaborating countries. However, it was not possible to get ethical approval for the study in a timely manner in these countries. Chile was not included in the study protocol paper as a collaborating country as it joined the study after publishing the study protocol. Therefore, instead of the planned 45 countries (Bóthe et al., 2021), only 42 individual countries are considered in the present study (see details at <https://osf.io/n3k2c/>)

<https://osf.io/n3k2c>), and conducted in accordance with the Helsinki Declaration, while every participant provided full consent before answering the survey. Furthermore, as part of the ISS project's transparency policy, readers may find a detailed description of the methods used and data cleaning process through its OSF registries (<https://osf.io/dk78r>)<sup>3</sup>.

## 2.2. Participants

Data cleaning of the ISS project database yielded 82,243 participants ( $M_{\text{age}} = 32.39$ ;  $SD = 12.52$ ). Participants' sociodemographic characteristics are detailed in Table 1.

[Insert Table 1 here]

## 2.3. Measures

Translated versions of scales used here and on the ISS are available on the project's OSF page<sup>4</sup>.

### 2.3.1. Sociodemographic and health related variables

The survey included several sociodemographic and general questions about physical, sexual, and mental health, including specific questions about the psychological impact of the COVID-19 pandemic.

### 2.3.2. Brief Symptom Inventory (BSI-12)

The BSI is a self-report measure designed to screen for psychological distress and psychiatric disorders and their severities. Using factor analysis, the BSI-18 was developed to measure somatization, depression, and anxiety, each with six items (Derogatis, 1982; Derogatis & Fitzpatrick, 2004). In the current study, however, we only assessed the two latter (i.e., depression and anxiety) in accordance with the ISS' goals (Böthe et al., 2021). Participants rated a series of symptoms using a 5-point Likert scale (0=Not at all; 4=Extremely) according to how much they

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<sup>3</sup> Publications: [https://osf.io/jb6ey/?view\\_only=0014d87bb2b546f7a2693543389b934d](https://osf.io/jb6ey/?view_only=0014d87bb2b546f7a2693543389b934d), Conference presentations: [https://osf.io/c695n/?view\\_only=7cae32e642b54d049e600ceb8971053e](https://osf.io/c695n/?view_only=7cae32e642b54d049e600ceb8971053e)

<sup>4</sup> [https://osf.io/jcz96/?view\\_only=9af0068dde81488db54638a01c8ae118](https://osf.io/jcz96/?view_only=9af0068dde81488db54638a01c8ae118)

disturbed respondents in the prior week. Furthermore, the scale provides the ‘caseness’ criterion (Derogatis, 2000) to distinguished between participants at high or low risk of depression and anxiety.

### **2.3.3. P4 Suicidality Risk Screener**

The P4 screener (Dube et al., 2010) is a questionnaire assessing suicide thoughts and risk through four screening questions regarding: past suicide attempts, a plan for suicide, the probability of completing suicide, and preventive factors. The scale was chosen for analytic purposes as a criterion variable for the ‘caseness’ criterion of the BSI scale, and for its widespread used to measure suicidality. The score was calculated by assigning and summing one point to the responses concerning suicidal ideation (see Figure 1 in Dube et al., 2010).

### **2.3.4. Compulsive Personality Assessment Scale (CPAS)**

The CPAS (Burkauskas & Fineberg, 2020; Fineberg et al., 2007) is an eight-item scale designed to assess compulsive personality traits including need for control and rigidity, among others. Respondents rated items using a 5-point Likert scale (0=Not at all characteristic of me; 4=Entirely characteristic of me). The scale was also chosen for analytic purposes as a criterion variable for the ‘caseness’ criterion of the BSI scale, and for its widespread used to measure compulsivity.

## **2.4. Analysis plan**

All validation studies included in the ISS survey followed a pre-registered analysis protocol.<sup>5</sup> We first examined descriptive statistics, and explored for patterns in the missing data using all 82,243 participants. Out of the total, 6,178 participants provided no answer in all BSI items, whereas 270 had at least one missing value. Nonetheless, missing values on the BSI-12 items

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<sup>5</sup> <https://osf.io/dk78r>

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were minimal (about 7.5%) and not missing completely at random (MCAR), as per assessed through Little's MCAR Test (Little, 1988;  $\chi^2 = 512.170$ ,  $df = 523$ ,  $p = 0.623$ ). Therefore, given the MCAR pattern results, the large sample size, and the ease of analyses, we employed a pairwise deletion of participants who provided no item response in the BSI, leaving a sample size of 76,065. Nevertheless, when conducting the criterion validity analyses, to improve the validity of this procedure and its results and its applicability for other studies and potential clinical applications, we opted not to impute any missing values while excluding cases by listwise deletion, leaving a sample size of 75,795. This constituted 270 ( $< 0.01\%$ ) cases less than the total sample used in other analyses based on the gender variable.

We used Confirmatory Factor Analysis (CFA) to estimate the two-correlated-factors model with items loading on one of the factors of anxiety or depression, consistent with the notion of multifaceted distress (Durá et al., 2006; Recklitis et al., 2017; Torres et al., 2013; Wiesner et al., 2010). Following the ISS project guidelines (Böthe et al., 2021), and due to the ordinal nature of the BSI-12 items, as well as the lack of multivariate normality in the data detected through Mardia's test (Mardia, 1970) ( $b_{\text{skew}} = 13.969$ ;  $b_{\text{kurt}} = 228.358$ ;  $ps < 0.001$ ), the Weighted Least Squares Means- and Variance-Adjusted (WLSMV) was used as the estimation method for CFA and invariance testing (Finney & DiStefano, 2013). The goodness of fit was evaluated using the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). For the CFI and TLI indices, estimated values above 0.90 and 0.95 indicate acceptable and good fit degrees, respectively (Hu & Bentler, 1999; Marsh et al., 2004). For the SRMR and RMSEA, values equal to or lower than 0.05 and 0.08 are considered good and acceptable, respectively (Browne & Cudeck, 1992; Hu & Bentler, 1999). All statistical analyses were conducted using Mplus v.8.2. (Muthén & Muthén, 2017). We also estimated reliability in terms of internal consistency in each

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subscale/factor, using both Cronbach's alpha (1951) and McDonald's omega (1970), respectively<sup>6</sup>.

Second, due to the large-scale and cross-cultural nature of the ISS study, we conducted measurement invariance to investigate the potential presence of structural differences in the BSI-12 based on participants' language, country, gender, and sexual orientation (van de Schoot et al., 2012; Vandenberg & Lance, 2000). Monte Carlo simulations<sup>7</sup> revealed that each group should have a minimum of 460 participants as the optimal sample size by level in each grouping variable examined. Based on this criterion, some groups were excluded from the analysis language (4 groups:  $n$ 's  $\leq 332$ ) and country of residence (9 groups:  $n$ 's  $\leq 385$ ; see Table 1). Alternately, for invariance analysis by gender and sexual orientation, some groups were collapsed into broader categories to maximize the number of participants studied (Borgogna et al., 2019; Feinstein et al., 2023; A description of the collapsed response options for the gender and sexual orientation variables can be found in Table 1). Further information regarding the rationale behind creating these groupings can be found in the ISS pre-registration document.

For measure invariance, we followed a specification sequence of analyses that successively incorporated more restrictive models by applying parameter constraints at the model structure (i.e., configural model) and factor loadings (i.e., metric model) levels. For these models, factors' means and variances were fixed to 0 and 1 in each group for identification, respectively. The equality of items' thresholds (four per item given five response options) and variances across groups were then examined by fitting first a scalar model with all residual variances freely

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<sup>6</sup> The tau-equivalence assumption (i.e., equal factor loadings for all items in factor models) is required for alpha to be comparable to the reliability coefficient (Cronbach, 1951). If this assumption is violated (also referred to as congeneric models), the reliability value will be underestimated depending on the severity of the violation (Green & Yang, 2009). Here, we opted to focus on interpreting the omegas because it corrects the underestimation bias of alpha in congeneric models (Dunn et al., 2014; Revelle & Zinbarg, 2008).

<sup>7</sup> See details <https://osf.io/dk78r>

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estimated and then compared with a residual model in which all residual variances were fixed to be equal in all groups. Finally, we examined the structural invariance of the model at the level of the variances and covariance between anxiety and depression factors (i.e., latent variance-covariance invariance) and their respective means (i.e., latent mean invariance; Vandenberg & Lance, 2000). We used the WLSMV estimator for all models, including a probit link and the theta parameterization.

We did not inspect  $\chi^2$  differences because, given our large sample size, they are prone to overestimating slight misfits (Meade et al., 2008). Differences in the relative fit indices (i.e., CFI, TLI, RMSEA) were examined following the criteria defined by Chen (2007) for large sample sizes, where  $\Delta\text{CFI}$  values  $\leq 0.010$  and  $\Delta\text{RMSEA}$  values  $\leq 0.015$  indicate invariance between groups, but including a more liberal cutoff for the RMSEA ( $\leq 0.10$ ). We also considered  $\Delta\text{RMSEA}$  ( $\leq 0.050$ ) and  $\Delta\text{CFI}$  ( $\leq 0.020$ ) indexes when using large sample size and multiple categories in measurement invariance tests (i.e., when there are at least ten groups in a two-factor model and a non-normal data distribution; Svetina & Rutkowski, 2017; Svetina et al., 2019). Finally, we included the change in TLI (i.e.,  $\Delta\text{TLI}$ ) fit index as a control measure for parsimony, following Chen (2007)'s criterion ( $\Delta\text{TLI} \leq 0.010$ ). Multiple comparisons across all levels of countries, languages, sexual orientations, and genders were performed using Kruskal Wallis' tests (see Supplementary Tables 4, 5, 6, and 7, respectively).

Finally, to assess the criterion-related validity of the BSI-12, we compared participants categorized as having a high or low risk for anxiety and depression on various criterion variables (i.e., physical, sexual, and mental health [see Table 3. for details]). To do this, following the standard case-rule scoring (cutoff point,  $\geq 63$  T-score for both scales; Derogatis, 2000) based on self-reported gender (i.e., men, women, and gender-diverse individuals) was used to identify cases with a high risk of anxiety or depression. Using this cutoff parameter, we compared

participants in both groups (i.e., low- and high-risk groups) in each disorder along the aforementioned correlates using Mann-Whitney tests for continuous and ordinal variables and chi-square tests for categorical variables. For the Mann-Whitney tests, the  $r$  indicator, based on the statistic  $z$  (Cohen, 1988), was reported as effect size, where 0.10 was considered as small, 0.30 as a medium, and 0.50 or greater as large differences. Likewise, for chi-square tests, Cramer's  $V$  and Phi (1946) were reported as effect size indicators, where 0.20 was considered as weak, 0.30 as a moderate, and higher than 0.40 as strong associations (Cohen, 1988; Rea & Parker, 1992).

### 3. Results

#### 3.1. Factor analysis and reliabilities

Standardized factor loadings and reliability indices of the two-factor model CFA can be seen in Supplemental Table 1. This model exhibited an excellent fit to the data (WLSMV  $\chi^2$  (53) = 23,070.197;  $p < 0.001$ ; CFI = 0.984; TLI = 0.981; RMSEA = 0.076 [90% CI = 0.075–0.076]). Standardized factor loadings ranged from 0.702 to 0.891 ( $ps < 0.001$ ), whereas inter-factor correlation was positive and strong ( $\Phi = 0.771$ ;  $p < 0.001$ ).

The internal consistency indices were excellent, and Cronbach's alpha ( $\alpha$ ) and McDonald's omega ( $\omega$ ) were consistently equal or larger than 0.90.

#### 3.2. BSI-12 measurement invariance analyses

Table 2 shows the results of the multigroup analysis of cross-cultural invariance of the BSI-12. Fit indices for the two-factor model across languages, countries, gender, and sexual orientation are depicted in Supplemental Tables 2 and 3, respectively. All factor loadings were statistically significant and similar across the groups tested ( $ps < 0.001$ ).

[Insert Figure 1 here]

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The country-based invariance was examined using two pseudo-randomly selected groups (based on alphabetical order), including the same number of countries, to avoid the non-convergence of parameter estimates due to having too many groups (Bou Malham & Saucier, 2014). The configural model showed good fit indices in both groups (CFIs  $\geq 0.982$ ; TLIs  $\geq 0.978$ ; RMSEA  $\leq 0.095$ ). Likewise, the values of  $\Delta$ CFI,  $\Delta$ TLI, and  $\Delta$ RMSEA were in the acceptable range, indicating that the two-factor model of BSI-12 was invariant at the structural level, including factor means, variances, and covariances.

[Insert Table 2 here]

Furthermore, the factor structure of the BSI-12 was also evaluated for each language, obtaining evidence of a good fit of the two-factor solution for most groups (see Supplemental Table 2). Specifically, the configural model exhibited satisfactory fit indices (CFI = 0.983; TLI = 0.979; RMSEA = 0.085 [90% CI = 0.084 – 0.086]). In addition, the multigroup analysis yielded evidence that the measurement model was psychometrically equivalent by language when models were increasingly constrained, revealing that no noteworthy variations in overall fit were detected according to  $\Delta$ CFI,  $\Delta$ TLI, and  $\Delta$ RMSEA. These results support the cross-cultural comparison (by language or country) of anxiety and depression levels among these conditions.

Subsequently, we examined potential measurement biases associated with participants' self-reported gender and sexual orientation conditions separately. Fit indices for the two-factor model are shown in Supplemental Table 3 for each group examined. All factor loadings were statistically significant and similar between the groups ( $ps < 0.001$ ).

For gender, the configural model showed good fit indices (CFI = 0.984; TLI = 0.980; RMSEA = 0.074 [90% CI = 0.074 – 0.075]). Importantly, the lack of substantive differences to the fit detriment after imposing constraints ( $\Delta$ CFIs  $\leq 0.007$ ;  $\Delta$ TLIs  $\leq 0.008$ ;  $\Delta$ RMSEA  $\geq 0.018$ ;

see Table 2) supports full structural invariance, suggesting that all parameters were equivalent regardless of participants' gender.

Regarding sexual orientation (Table 2), the configural invariance was supported by good fit indices (CFI = 0.984; TLI = 0.980; RMSEA = 0.074 [90% CI = 0.074 – 0.075]). Likewise, the two-factor model of BSI-12 demonstrated structural invariance across groups. All models showed acceptable fit, and no notable deviation was evident between constrained and freely estimated models.

### **3.3. BSI-12 cut-off scores and criterion-related validity**

BSI-12 anxiety and depression T scores were transformed, in each gender condition, using raw scores of each subscale by summing all items. As a result, we identified participants with a high or low risk of anxiety or depression, and tested criterion-related evidence. Tables 3, 4, and 5 compare men, women, or gender-diverse participants' physical, sexual, and mental health in the low- and high-risk cut-off scores of anxiety and depression groups, respectively.

Overall, 13.75% of participants scored above caseness thresholds for high risk for depression and anxiety. Women had a higher proportion of high-risk cases of both depression (14%) and anxiety (14.1%) than men and gender-diverse individuals (< 13.5 %). For anxiety and depression subscale scores, there were significant differences regardless of whether we compared high- and low-risk participants for anxiety or depression ( $ps < 0.001$ ), reflecting their comorbidity. However, the effect size of the differences in anxiety was consistently larger between participants at high- and low-risk for anxiety ( $rs \geq 0.585$ ) than for depression ( $rs \leq 0.400$ ). Conversely, the differences in depression were more notable between the high- and low-risk groups for depression ( $rs \geq 0.578$ ) than for anxiety ( $rs \leq 0.406$ ), reflecting specificity in the expression and frequency of symptoms. This effect was generalized in men, women, and gender-diverse participants.

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[Insert Table 3 here]

Regarding physical illnesses, there were no significant differences in relationships between men with high and low risk of anxiety ( $\chi^2 = 1.544$ ;  $p = 0.214$ ) or depression ( $\chi^2 = 3.476$ ;  $p = 0.062$ ). Consistent with the above, although there were statistically significant effects between women ( $\chi^2 \geq 35.168$ ;  $ps < 0.001$ ) and individuals of gender diversities ( $\chi^2 \geq 6.643$ ;  $ps \leq 0.010$ ), in both cases, effect sizes for anxiety ( $Vs \leq 0.057$ ) and depression ( $Vs \leq 0.052$ ) were marginal. In the same vein, there were significant, yet slight effects on experiencing sexual problems in men (anxiety:  $\chi^2 = 134.082$ ;  $p < 0.001$ ;  $V = 0.068$ , depression:  $\chi^2 = 210.896$ ;  $p < 0.001$ ;  $V = 0.086$ ), women (anxiety:  $\chi^2 = 144.448$ ;  $p = 0.001$ ;  $V = 0.059$ , depression:  $\chi^2 = 248.082$ ;  $p < 0.001$ ;  $V = 0.077$ ), and gender-diverse participants (anxiety:  $\chi^2 = 7.808$ ;  $p = 0.005$ ;  $V = 0.056$ , depression:  $\chi^2 = 6.339$ ;  $p = 0.012$ ;  $V = 0.051$ ).

[Insert Table 4 here]

Contrarily, participants experiencing mental illness or emotional problems showed larger effect sizes than those facing physical and sexual concerns. Among men, those with a high risk of anxiety or depression exhibited significantly higher levels of mental or emotional concerns (anxiety:  $\chi^2 = 2,092.804$ ;  $p < 0.001$ ;  $V = 0.269$ , depression:  $\chi^2 = 2,552.636$ ;  $p < 0.001$ ;  $V = 0.297$ ). This effect, although slightly less pronounced, was also observed in women (anxiety:  $\chi^2 = 2,585.649$ ;  $p < 0.001$ ;  $V = 0.249$ , depression:  $\chi^2 = 2,478.568$ ;  $p < 0.001$ ;  $V = 0.244$ ) and gender-diverse individuals (anxiety:  $\chi^2 = 70.987$ ;  $p < 0.001$ ;  $V = 0.169$ , depression:  $\chi^2 = 45.023$ ;  $p < 0.001$ ;  $V = 0.135$ ). Similar patterns of differences emerged when examining psychological concerns, specifically emotional concerns and perceived stress related to the COVID-19 pandemic. Participants with a high risk of anxiety had higher perceived stress, with moderate effect sizes ranging from  $r = 0.133$  to  $r = 0.183$  ( $Zs \leq -6.641$ ;  $ps < 0.001$ ). This was also observed in participants at high risk of depression, although with slightly smaller effect sizes ranging from

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$r = 0.088$  to  $r = 0.162$  ( $Zs \leq -4.382$ ;  $ps < 0.001$ ). For emotional concerns, significant differences were found for participants at high risk of anxiety ( $Zs \leq -4.382$ ;  $ps < 0.001$ ) or depression ( $Zs \leq -2.282$ ;  $ps \leq 0.023$ ), albeit relatively small in effect size among those at risk for depression ( $rs \leq 0.095$ ) or anxiety ( $rs \leq 0.105$ ).

[Insert Table 5 here]

When analyzing compulsive personality traits as a criterion variable, although both group of participants identified with a high risk of anxiety ( $Zs \leq -8.667$ ;  $ps < 0.001$ ) and depression ( $Zs \leq -7.411$ ;  $ps < 0.001$ ) showed significantly higher scores on the CPAS, the effect sizes were slightly larger for participants in the high-risk group for anxiety ( $rs \leq 0.222$ ) compared to those in the high-risk group for depression ( $rs \leq 0.191$ ). These differences in effect size align with the overlap reported between these three disorders (Goodwin, 2015).

This pattern was reversed when examining the potential risk of suicide. First, participants identified as being at high risk of developing depression reported a significant prevalence of self-harm thoughts, with effect sizes ranging from moderate to larger ( $V = 0.194$ – $0.309$ ;  $\chi^2s \geq 92.545$ ;  $ps < 0.001$ ). In contrast, participants at high risk of developing anxiety showed smaller effect sizes, ranging from  $V = 0.169$  to  $V = 0.211$  ( $\chi^2s \geq 70.150$ ;  $ps < 0.001$ ). Second, this difference in effect size was also evident in the comparisons involving the risk of depression when considering the sum scores from the P4 screener. Comparing participants at high risk of anxiety, significant differences were found with moderate effect sizes ( $r = 0.223$ – $0.238$ ;  $Zs \leq -11.798$ ;  $ps < 0.001$ ). On the other hand, participants at a higher risk of depression showed consistently significant differences, accompanied by larger effect sizes ( $r = 0.317$ – $0.332$ ;  $Zs \leq -15.723$ ;  $ps < 0.001$ ).

## 4. Discussion

Cross-cultural research is at the forefront when systematically considering similarities and differences across cultures and societies, significantly informing clinical standards across

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countries. However, pitfalls may hinder replicability of these cross-cultural studies (Allik et al., 2012; Jeong & Lee, 2019). Therefore, the present study comprehensively examined the psychometric properties and validated a depression and anxiety screener (i.e., BSI-12) in 42 countries. Our findings suggest that the depression and anxiety sub-dimensions of the original BSI-18 demonstrated good structural validity, reliability, and measurement invariance across multiple groups and satisfactorily distinguished low-risk and high-risk participants.

Our results support a two-factor latent structure of the BSI-12 in a diverse sample of adults. The BSI-18, which includes three domains (i.e., depression, anxiety, and somatization) supported a three-dimensional structure. Thus, and in line with previous findings (e.g., Franke et al., 2017; Recklitis et al., 2017), the BSI demonstrated good reliability, showing a positive, strong association with suicidality and small-to-medium with behavioral indicators.

The results supported a latent means level of invariance for all groups. Regarding country-based measurement invariance, differences in total BSI-12 scores across countries ranged between 8–20 points (Figure 1). Countries within the fifth highest scores in the BSI averaged a 2021-Human Development Index (HDI) of 0.744 which is deemed high, whereas the fifth lowest scores average a HDI of .891, which is deemed very high. The HDI is a compound measure comparing countries on living standards, education, health and quality of life (UNDP, 2023). Countries with high HDIs tend to invest more heavily in mental health (see Knapp & Wong, 2020), based, in part, on data supporting the cost-utility ratio of treating mental health concerns (e.g., Arias et al., 2022; Brettschneider et al., 2015). However, reports on a phenomenon called the “vulnerability paradox” show the mix results in the literature when it comes to establishing a negative relationship between HDI or other country-wide estimates (e.g., gross domestic product per capita, or a positive relationship with the vulnerability index) and mental health disorder’s

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prevalence (Dückers & Brewin, 2016; Dücker et al., 2019; Jorm & Mulder, 2021). Still, this study supports growing evidence of the world-wide disparities in affective disorders.

Regarding language-based measurement invariance, the BSI-12 could comparably operate across all 26 languages tested, in accordance with previous studies examining different populations (Lu et al., 2019; Torres et al., 2013). This is relevant for cross-cultural research, given that both depression and anxiety are sensitive to cultural and contextual factors (Bredström, 2019; Hofmann & Hinton, 2014; Lewis-Fernández et al., 2010). Nevertheless, while psychometric tools may offer unbiased, systematic, and straightforward ways to assess symptomatology of depression or anxiety, cultural differences remain. Future studies should consider such differences, even when using cross-culturally valid and invariant scales like the BSI-12, as well as when conducting mixed-methods research.

Regarding sexual orientation- and gender-based measurement invariance, in line with previous findings (Ploderl & Tremblay, 2015), cis-gender and heterosexual people scored significantly lower than other sexual minorities, and did so with large magnitudes (see Figure 1 and Supplementary Tables 6 and 7). These results corroborate previous findings on depression and anxiety where men scored lower than women (Steel et al., 2014), while women scored lower than gender-diverse individuals (Wittgens et al., 2022), and heterosexual individuals scored lower than other sexual orientations (Ross et al., 2018). Gender-diverse individuals' poor mental health is similar to transgender individuals (Chew et al., 2020). The present finding address a gap regarding the omission or exclusion of sexual orientation and gender identity as variables in relation to affective concerns, despite related mental health disparities in these minority groups (Heck et al., 2017). Therefore, the current study provides not only cross-cultural validation, but also supports that the BSI-12 comparably operates across genders and sexual orientations.

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The “caseness” criterion (Derogatis, 2000) accurately distinguished between participants with a high risk of depression and anxiety having experienced mental, physical, emotional, or sexual problems. Whereas the criterion was able to distinguish between low- and high-risk depression and anxiety cases, the effect size of the average differences in the non-parametric test was greater among the depression-risk groups than among the anxiety-risk groups. For both anxiety and depression risk contrasts, there was an effect on the suicidal ideation criterion. However, in the case of anxiety, this effect was the second highest, following the reporting of suffering from mental or emotional problems. Conversely, the effect of suicidal thoughts was the most pronounced among participants at high risk of depression. In contrast, criterion variables related to compulsive personality and sexual problems or physical illness yielded small effect sizes when discriminating between low- and high-risk depression and anxiety cases. Similarly, the emotional toll and perceived stress due to the COVID-19 pandemic yielded significant differences between low- and high-risk groups for both depression and anxiety, yet of small effect sizes.

### **4.1. Limitations and future studies**

Study limitations warrant mention. First, the predictive validation was not made against a clinical diagnosis, which is considered the gold standard diagnostic tool for either anxiety or depression. Second, the full BSI-18 scale was not examined, with the somatization sub-dimension excluded based on the study aims including the assessing of specific psychopathology associated with specific sexual concerns while simultaneously limiting subject burden (Bóthe et al., 2021; Islam et al., 2022; Weinandy et al., 2023). Future studies should examine the entire BSI-18 to be a fully invariant tool. Third, the study was conducted online, mainly by advertisements through social media, national news websites, and the aid of survey services such as Prolific. Their sample pool has been described—by the company itself—as skewed towards women, younger, and highly educated populations, especially in western, educated,

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industrialized, rich, and democratic (WEIRD) countries (Prolific, 2023). Thus, while a cross-cultural sample helps to improve the generalizability of these results towards more populations, it still struggles with the limitations that stem from predominantly WEIRD samples (Henrich et al., 2010a, 2010b). Therefore, whereas these services make surveying easier and faster, the samples are likely less representative of a world reality, and while oversampling women may help promote women's health, other groups also warrant consideration. Building upon our work, future studies should also investigate underrepresented gender groups and sexual and racial/ethnic diversities (Brance et al., 2023) to help promote equity (Weersing et al., 2022), as well as other demographic variables of interest such as age generation differences (Twenge, 2011; Twenge, 2015). Finally, the ISS has general limitations that are described in the project's OSF page ([https://osf.io/n3k2c/?view\\_only=838146f6027c4e6bb68371d9d14220b5](https://osf.io/n3k2c/?view_only=838146f6027c4e6bb68371d9d14220b5)).

### **5. Conclusions**

This study is the first transcultural validation of the BSI-12, demonstrating that the scale is psychometrically reliable and valid to measure depression and anxiety, as well as invariant across countries, languages, genders, and sexual orientations.

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CROSS-CULTURAL VALIDATION OF THE BSI-12

**Table 1.**  
*Summary table of sociodemographic characteristics of the study population*

Country of residence		<i>n</i>	%		<i>n</i>	%	
Africa	Algeria <sup>a</sup>	24	<0.1	Europe	Austria	746	0.9
	South Africa	1,849	2.2		Belgium	644	0.8
America	Bolivia <sup>a</sup>	385	0.5	Croatia	2,390	2.9	
	Brazil	3,579	4.4	Czech Republic	1,640	2.0	
	Canada	2,541	3.1	France	1,706	2.1	
	Chile	1,173	1.4	Germany	3,271	4.0	
	Colombia	1,913	2.3	Gibraltar <sup>a</sup>	64	<0.1	
	Ecuador <sup>a</sup>	276	0.3	Hungary	11,200	13.6	
	Mexico	2,137	2.6	Ireland	1,702	2.1	
	Panama <sup>a</sup>	333	0.4	Italy	2,401	2.9	
	Peru	2,672	3.2	Lithuania	2,015	2.5	
	United States	2,398	2.9	North Macedonia	1,251	1.5	
Asia	Bangladesh <sup>a</sup>	373	0.5	Poland	9,892	12.0	
	China	2,428	3.0	Portugal	2,262	2.8	
	India <sup>a</sup>	194	0.2	Slovakia	1,134	1.4	
	Iraq <sup>a</sup>	99	0.1	Spain	2,327	2.8	
	Israel	1,334	1.6	Switzerland	1,144	1.4	
	Japan	562	0.7	Turkey	820	1.0	
	Malaysia	1,170	1.4	United Kingdom	1,412	1.7	
	South Korea	1,464	1.8	Oceania	Australia	639	0.8
	Taiwan	2,668	3.2	New Zealand	2,834	3.4	
	<b>Language</b>		<b><i>n</i></b>	<b>%</b>		<b><i>n</i></b>	<b>%</b>
	Arabic <sup>a</sup>	142	0.2	Korean	1,437	1.7	
	Bangla <sup>a</sup>	332	0.4	Lithuanian	2,094	2.5	
	Croatian	2,522	3.1	Macedonian	1,301	1.6	
	Czech	1,583	1.9	Mandarin – simplified	2,474	3.0	
	Dutch	518	0.6	Mandarin – traditional	2,685	3.3	
	English	13,994	17.0	Polish	10,343	12.6	
	French	3,941	4.8	Portuguese – Brazil	3,650	4.4	
	German	3,494	4.2	Portuguese – Portugal	2,277	2.8	
	Hebrew	1,315	1.6	Slovak	2,118	2.6	
	Hindi <sup>a</sup>	17	<0.1	Spanish – Latin America	8,926	10.9	
	Hungarian	10,937	13.3	Spanish – Spain	2,312	2.8	
	Italian	2,437	3.0	Turkish	853	1.0	
	Japanese	466	0.6				
<b>Religion</b>		<b><i>n</i></b>	<b>%</b>		<b><i>n</i></b>	<b>%</b>	
	Buddhist	1,526	1.9	Sikh	33	<0.1	
	Christian	24,080	29.3	Spiritism	426	0.5	
	Confucianist	18	<0.1	Taoist	627	0.8	
	Hindu	246	0.3	Spiritual but no committed to one religion	11,330	13.8	
	Jain	14	<0.1	I am not religious	39,331	47.8	
	Jewish	1,288	1.6	Other	2,166	2.6	
	Muslim	1,097	1.3				

CROSS-CULTURAL VALIDATION OF THE BSI-12

**Table 1.** (continued)

*Summary table of sociodemographic characteristics of the study population*

<b>Current place of residence</b>	<b><i>n</i></b>	<b>%</b>	<b>Highest level of education</b>	<b><i>n</i></b>	<b>%</b>
Metropolis (> 1 million people)	26,441	32.1	Primary ( <i>e.g.</i> , Elementary school)	1,002	1.2
City (100,000 – 999,999 people)	29,920	36.4	Secondary ( <i>e.g.</i> , High school)	20,325	24.7
Town (1,000 – 99,999 people)	21,103	25.7	Tertiary ( <i>e.g.</i> , College/University)	60,896	74.1
Village (< 1,000 people)	4,764	5.8			
<b>Currently studying?</b>	<b><i>n</i></b>	<b>%</b>	<b>Currently working?</b>	<b><i>n</i></b>	<b>%</b>
No	49,802	60.6	No	20,853	23.4
Yes, in primary education	64	<0.1	Yes, full time	42,981	52.3
Yes, in secondary education	1,571	1.9	Yes, part-time	11,356	13.8
Yes, in tertiary education	30,762	37.4	Yes, I do odd jobs	7,029	8.5
<b>Socio-Economical Status</b>	<b><i>n</i></b>	<b>%</b>		<b><i>n</i></b>	<b>%</b>
Among the worst	227	0.3	Better than average	31,567	38.4
Much worse than average	773	0.9	Much better than average	14,736	17.9
Worse than average	4,232	5.1	Among the best	3,957	4.8
Average	26,742	32.5			
<b>Gender (original) <sup>b</sup></b>	<b><i>n</i></b>	<b>%</b>	<b>Gender (used) <sup>c</sup></b>	<b><i>n</i></b>	<b>%</b>
Masculine/Man	32,549	39.6	Man	32,549	39.6
Feminine/Woman	46,874	57.0	Woman	46,874	57.0
Indigenous or other cultural gender minority identity ( <i>e.g.</i> , two-spirit)	166	0.2	Gender-diverse individuals	2,783	3.4
Non-binary, gender fluid, or something else ( <i>e.g.</i> , genderqueer)	2,315	2.8			
Other	302	0.4			
<b>Trans status</b>	<b><i>n</i></b>	<b>%</b>	<b>Relationship status</b>	<b><i>n</i></b>	<b>%</b>
No, I am not a trans person	79,280	96.4	Single	27,541	33.5
Yes, I am a trans man	357	0.4	In a relationship	27,440	33.4
Yes, I am a trans woman	295	0.4	Married or common-law partners	24,338	29.6
Yes, I am a non-binary trans person	881	1.1	Widow or widower	428	0.5
I am questioning my gender	1,137	1.4	Divorced	2,472	3.0
I don't know what it means	269	0.3			
<b>Sexual orientation (original) <sup>b</sup></b>	<b><i>n</i></b>	<b>%</b>	<b>Sexual orientation (used) <sup>c</sup></b>	<b><i>n</i></b>	<b>%</b>
Heterosexual/Straight	56,125	68.2	Heterosexual	56,125	68.2
Gay or lesbian or Homosexual	4,607	5.6	Gay or lesbian or Homosexual	4,607	5.6
Heteroflexible	6,200	7.5	Bisexual	7,688	9.3
Homoflexible	534	0.6	Queer or pansexual	2,926	3.6
Bisexual	7,688	9.3	Homo- or heteroflexible identity	6,734	8.2
Queer	957	1.2	Asexual	1,064	1.3
Pansexual	1,969	2.4	Questioning	1,951	2.4
Asexual	1,064	1.3	Other	807	1.0
I don't know yet or I am currently questioning my sexual orientation	1,951	2.4			
None of the above	807	1.0			
I don't want to answer	308	0.4			

*Note.* Percentages might not add up to 100% due to missing data in each variable. a: This group was discarded from invariance analysis due to insufficient sample size. b: Original response options available in the survey. c: Collapsed response options used in the analysis.

CROSS-CULTURAL VALIDATION OF THE BSI-12

**Table 2.**

*Multigroup analysis of the Brief Symptom Inventory (BSI-12) by country of residence, language and self-reported gender and sexual orientation*

Groups	Model	Fit indices					Model comparison				
		WLSMV $\chi^2$	df	CFI	TLI	RMSEA [CI <sub>90%</sub> ]	Pair	$\Delta$ df	$\Delta$ CFI	$\Delta$ TLI	$\Delta$ RMSEA
Country (Group 1)	M1. Configural	14,448.594*	901	0.982	0.978	0.083 [0.082-0.084]					
	M2. Metric	15,596.609*	1061	0.981	0.980	0.079 [0.078-0.080]	M2-M1	160	-0.001	0.002	-0.004
	M3. Scalar	33,063.223*	1605	0.961	0.971	0.095 [0.094-0.096]	M3-M2	544	-0.020	-0.009	0.016
	M4. Residual	41,115.505*	1785	0.948	0.967	0.101 [0.100-0.101]	M4-M3	180	-0.011	-0.004	0.005
	M5. Latent variance-covariance	22,867.147*	1833	0.972	0.983	0.073 [0.072-0.073]	M5-M4	48	0.024	0.016	-0.028
	<b>M6. Latent means</b>	<b>29,982.336*</b>	<b>1863</b>	<b>0.963</b>	<b>0.978</b>	<b>0.083 [0.082-0.084]</b>	<b>M6-M5</b>	<b>30</b>	<b>-0.009</b>	<b>-0.005</b>	<b>0.010</b>
Country (Group 2)	M1. Configural	15,299.593*	901	0.984	0.980	0.086 [0.085-0.088]					
	M2. Metric	14,056.682*	1061	0.985	0.984	0.076 [0.075-0.077]	M2-M1	160	0.001	0.004	-0.010
	M3. Scalar	30,442.069*	1605	0.967	0.977	0.092 [0.091-0.093]	M3-M2	544	-0.018	-0.007	0.016
	M4. Residual	31,525.637*	1785	0.966	0.979	0.088 [0.087-0.089]	M4-M3	180	-0.001	0.002	-0.004
	M5. Latent variance-covariance	16,720.571*	1833	0.983	0.990	0.062 [0.061-0.062]	M5-M4	48	0.017	0.010	-0.025
	<b>M6. Latent means</b>	<b>20,185.463*</b>	<b>1863</b>	<b>0.979</b>	<b>0.987</b>	<b>0.068 [0.067-0.069]</b>	<b>M6-M5</b>	<b>30</b>	<b>-0.004</b>	<b>-0.003</b>	<b>0.006</b>
Language	M1. Configural	30,160.712*	1166	0.983	0.979	0.085 [0.084-0.086]					
	M2. Metric	30,441.380*	1376	0.983	0.982	0.078 [0.078-0.079]	M2-M1	210	<0.001	0.003	-0.007
	M3. Scalar	66,957.846*	2090	0.963	0.974	0.095 [0.094-0.096]	M3-M2	714	-0.020	-0.009	0.019
	M4. Residual	77,839.525*	2330	0.956	0.973	0.097 [0.097-0.098]	M4-M3	240	-0.007	-0.001	0.002
	M5. Latent variance-covariance	41,651.910*	2393	0.976	0.986	0.069 [0.069-0.070]	M5-M4	63	0.020	0.013	-0.028
	<b>M6. Latent means</b>	<b>53,950.260*</b>	<b>2433</b>	<b>0.970</b>	<b>0.982</b>	<b>0.079 [0.078-0.079]</b>	<b>M6-M5</b>	<b>40</b>	<b>-0.006</b>	<b>-0.004</b>	<b>0.010</b>
Gender	M1. Configural	22,454.722*	159	0.984	0.980	0.074 [0.074-0.075]					
	M2. Metric	15,486.690*	179	0.989	0.988	0.058 [0.057-0.059]	M2-M1	20	0.005	0.008	-0.017
	M3. Scalar	22,452.771*	247	0.984	0.987	0.060 [0.059-0.060]	M3-M2	68	-0.005	-0.001	0.002
	M4. Residual	20,330.587*	259	0.986	0.989	0.055 [0.055-0.056]	M4-M3	12	0.002	0.002	-0.005
	M5. Latent variance-covariance	9,506.150*	265	0.993	0.995	0.037 [0.036-0.038]	M5-M4	6	0.007	0.006	-0.018
	<b>M6. Latent means</b>	<b>13,731.841*</b>	<b>267</b>	<b>0.990</b>	<b>0.993</b>	<b>0.045 [0.044-0.045]</b>	<b>M6-M5</b>	<b>2</b>	<b>-0.003</b>	<b>-0.002</b>	<b>0.008</b>
Sexual orientation	M1. Configural	22,699.096*	424	0.984	0.980	0.074 [0.074-0.075]					
	M2. Metric	15,880.136*	494	0.989	0.988	0.057 [0.057-0.058]	M2-M1	70	0.005	0.008	-0.017
	M3. Scalar	20,763.284*	732	0.985	0.989	0.054 [0.053-0.054]	M3-M2	238	-0.004	0.001	-0.003
	M4. Residual	17,715.159*	804	0.988	0.992	0.047 [0.047-0.048]	M4-M3	72	0.003	0.003	-0.007
	M5. Latent variance-covariance	8,332.040*	825	0.994	0.996	0.031 [0.030-0.032]	M5-M4	21	0.006	0.004	-0.016
	<b>M6. Latent means</b>	<b>10,539.393*</b>	<b>837</b>	<b>0.993</b>	<b>0.995</b>	<b>0.035 [0.034-0.036]</b>	<b>M6-M5</b>	<b>12</b>	<b>-0.001</b>	<b>-0.001</b>	<b>0.004</b>

Note.  $\chi^2$  = Chi-square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis Index; RMSEA = root-mean-square error of approximation;  $\Delta$ CFI,  $\Delta$ TLI, and  $\Delta$ RMSEA = change in CFI/TLI, RMSEA values compared to the preceding model. Bold letters indicate the final level of invariance that was achieved. \*  $p < .001$ .

CROSS-CULTURAL VALIDATION OF THE BSI-12

**Table 3.**

*Comparison of men's clinical characteristics in the low- and high-risk of anxiety and depression groups based on the Brief Symptom Inventory (BSI-12)*

Variables	Low-risk anxiety (n = 25,969; 86.7%)			High-risk anxiety (n = 3,989; 13.3%)			Mann-Whitney <i>U</i> tests			
	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>U</i>	<i>Z</i>	<i>p</i>	<i>r effect size</i>
Brief Symptom Inventory total score (BSI-12)	8.55	7.11	7.00	29.57	7.54	29.00	2,854,190.00	-96.338	<0.001	0.557
Anxiety Factor	3.70	3.18	3.00	15.52	3.20	15.00	0	-102.334	<0.001	0.591
Depression Factor	4.85	4.85	3.00	14.06	5.68	14.00	11,997,382.50	-78.574	<0.001	0.454
Valuation of life circumstances compared to others <sup>a</sup>	4.92	1.01	5.00	4.52	1.09	5.00	41,555,591.00	-21.064	<0.001	0.122
Emotionally affected by the COVID-19 pandemic <sup>b</sup>	4.02	1.76	4.00	4.58	1.80	5.00	39,083,733.50	-17.704	<0.001	0.104
Perceived stress related to the COVID-19 pandemic <sup>c</sup>	3.42	1.67	3.00	4.41	1.82	5.00	32,844,111.50	-31.029	<0.001	0.183
Compulsive Personality Assessment Scale total score <sup>d</sup>	12.79	4.92	13.00	16.24	5.06	16.00	32,094,036.00	-38.339	<0.001	0.222
Potential suicide risk (P4 Screener)	0.35	0.78	0.00	0.97	1.19	0.00	33,707,750.00	-37.747	<0.001	0.223

  

Variables	Low-risk anxiety (n = 25,969; 86.7%)		High-risk anxiety (n = 3,989; 13.3%)		$\chi^2$ tests			
	n	%	n	%	$\chi^2$	<i>p</i>	<i>Phi</i>	<i>Cramer's V</i>
Suffering from any mental illness or emotional problems?								
Yes	4,475	17.83	1,940	50.87	2,092.804	<0.001	0.269	0.269
No	20,623	82.17	1,874	49.13				
Suffering from any physical illness?								
Yes	5,501	21.94	802	21.04	1.546	0.214	0.007	0.007
No	19,575	78.06	3,811	78.96				
Suffering from any sexual problems?								
Yes	2,861	11.44	687	18.06	134.082	<0.001	0.068	0.068
No	22,151	88.56	3,117	81.94				
Have you had thoughts of actually hurting yourself?								
Yes	5,789	23.31	1,924	50.90	1,267.719	<0.001	0.211	0.211
No	19,041	76.69	1,856	49.10				

  

Variables	Low-risk depression (n = 25,917; 86.5%)			High-risk depression (n = 4,041; 13.5%)			Mann-Whitney <i>U</i> tests			
	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>U</i>	<i>Z</i>	<i>P</i>	<i>r effect size</i>
Brief Symptom Inventory total score (BSI-12)	8.48	7.01	7.00	29.71	7.34	29.00	2,470,152.50	-97.681	<0.001	0.564
Anxiety Factor	4.21	4.10	3.00	12.07	5.78	12.00	14,222,835.50	-74.948	<0.001	0.433
Depression Factor	4.27	3.78	3.00	17.64	3.00	17.00	0	-102.821	<0.001	0.594
Valuation of life circumstances compared to others <sup>a</sup>	4.94	1.00	5.00	4.41	1.10	4.00	38,704,618.00	-27.966	<0.001	0.162
Emotionally affected by the COVID-19 pandemic <sup>b</sup>	4.03	1.76	4.00	4.52	1.85	5.00	40,683,776.50	-15.774	<0.001	0.093
Perceived stress related to the COVID-19 pandemic <sup>c</sup>	3.44	1.67	3.00	4.31	1.87	5.00	35,110,311.00	-27.570	<0.001	0.162
Compulsive Personality Assessment Scale total score <sup>d</sup>	12.85	4.93	13.00	15.82	5.19	16.00	35,319,987.50	-32.986	<0.001	0.191
Potential suicide risk (P4 Screener)	0.31	0.73	0.00	1.22	1.24	1.00	27,592,883.50	-56.238	<0.001	0.332

CROSS-CULTURAL VALIDATION OF THE BSI-12

**Table 3.** (continued)

*Comparison of men's clinical characteristics in the low- and high-risk of anxiety and depression groups based on the Brief Symptom Inventory (BSI-12)*

Variables	Low-risk depression (n = 25,917; 86.5%)		High-risk depression (n = 4,041; 13.5%)		$\chi^2$ tests			
	n	%	n	%	$\chi^2$	p	Phi	Cramer's V
Suffering from any mental illness or emotional problems?								
Yes	4,337	17.33	2,078	53.54	2,552.636	<0.001	0.297	0.297
No	20,694	82.67	1,803	46.46				
Suffering from any physical illness?								
Yes	5,412	21.64	891	22.97	3.476	0.062	0.011	0.011
No	19,596	78.36	3,879	77.03				
Suffering from any sexual problems?								
Yes	2,795	11.21	753	19.45	210.896	<0.001	0.086	0.086
No	22,149	88.79	3,119	80.55				
Have you had thoughts of actually hurting yourself?								
Yes	5,344	21.57	2,369	61.82	2,730.990	<0.001	0.309	0.309
No	19,434	78.43	1,463	38.18				

*Note.* M = Mean; SD = Standard deviation; Mdn = Median. a: 1 = Among the worst; 2 = Much worse than average; 3 = Worse than average; 4 = Average; 5 = Better than average; 6 = Much better than average; 7 = Among the best. b: 1 = Not at all; 7 = Very much. c: 1 = No stress; 7 = Extreme stress. d: 0 = Not at all characteristic of me; 1 = Rather not characteristic of me; 2 = Somewhat characteristic of me; 3 = Characteristic of me; 4 = Entirely characteristic of me.

CROSS-CULTURAL VALIDATION OF THE BSI-12

**Table 4.**

*Comparison of women’s clinical characteristics in the low- and high-risk of anxiety and depression groups based on the Brief Symptom Inventory (BSI-12)*

Variables	Low-risk anxiety (n = 37,156; 85.9%)			High-risk anxiety (n = 6,100; 14.1%)			Mann-Whitney U tests			
	M	SD	Mdn	M	SD	Mdn	U	Z	p	r effect size
Brief Symptom Inventory total score (BSI-12)	11.52	8.09	10.00	32.34	7.12	32.00	7,862,401.50	-116.740	<0.001	0.561
Anxiety Factor	5.69	4.03	5.00	17.95	2.63	17.00		-125.615	<0.001	0.604
Depression Factor	5.83	5.09	4.00	14.39	5.79	15.00	31,961,916.50	-90.218	<0.001	0.434
Valuation of life circumstances compared to others <sup>a</sup>	4.82	0.95	5.00	4.58	1.02	5.00	98,583,516.00	-17.221	<0.001	0.083
Emotionally affected by the COVID-19 pandemic <sup>b</sup>	4.24	1.63	4.00	4.73	1.70	5.00	85,724,823.50	-21.374	<0.001	0.105
Perceived stress related to the COVID-19 pandemic <sup>c</sup>	3.93	1.61	4.00	4.79	1.68	5.00	73,083,263.00	-36.591	<0.001	0.180
Compulsive Personality Assessment Scale total score <sup>d</sup>	13.03	4.82	13.00	15.97	5.18	16.00	75,716,280.50	-40.990	<0.001	0.197
Potential suicide risk (P4 Screener)	0.54	0.94	0.00	1.27	1.30	1.00	69,002,733.50	-46.828	<0.001	0.231

  

Variables	Low-risk anxiety (n = 37,156; 85.9%)		High-risk anxiety (n = 6,100; 14.1%)		$\chi^2$ tests			
	n	%	n	%	$\chi^2$	p	Phi	Cramer’s V
Suffering from any mental illness or emotional problems?								
Yes	10,580	29.56	3,725	63.60	2,585.649	<0.001	0.249	0.249
No	25,208	70.44	2,132	36.40				
Suffering from any physical illness?								
Yes	7,152	20.01	1,368	23.38	35.168	<0.001	0.029	0.029
No	28,598	79.99	4,483	76.62				
Suffering from any sexual problems?								
Yes	2,749	7.72	724	12.42	144.448	<0.001	0.059	0.059
No	32,878	92.28	5,105	87.58				
Have you had thoughts of actually hurting yourself?								
Yes	11,536	32.77	3,508	60.99	1,694.070	<0.001	0.203	0.203
No	23,668	67.23	2,244	39.01				

  

Variables	Low-risk depression (n = 37,201; 86.0%)			High-risk depression (n = 6,055; 14.0%)			Mann-Whitney U tests			
	M	SD	Mdn	M	SD	Mdn	U	Z	p	r effect size
Brief Symptom Inventory total score (BSI-12)	11.49	8.00	10.00	32.73	6.83	33.00	6,348,574.00	-118.006	<0.001	0.567
Anxiety Factor	6.27	4.94	5.00	14.47	5.39	15.00	31,264,099.00	-90.465	<0.001	0.435
Depression Factor	5.21	4.08	4.00	18.26	2.71	18.00		-125.269	<0.001	0.602
Valuation of life circumstances compared to others <sup>a</sup>	4.84	0.94	5.00	4.45	1.01	4.00	88,321,033.50	-28.489	<0.001	0.137
Emotionally affected by the COVID-19 pandemic <sup>b</sup>	4.24	1.62	4.00	4.68	1.72	5.00	87,058,862.50	-19.274	<0.001	0.095
Perceived stress related to the COVID-19 pandemic <sup>c</sup>	3.95	1.61	4.00	4.66	1.72	5.00	77,700,887.50	-30.572	<0.001	0.150
Compulsive Personality Assessment Scale total score <sup>d</sup>	13.09	4.86	13.00	15.61	5.15	15.00	80,503,691.50	-34.927	<0.001	0.168
Potential suicide risk (P4 Screener)	0.49	0.89	0.00	1.55	1.32	2.00	55,088,234.00	-66.519	<0.001	0.328

CROSS-CULTURAL VALIDATION OF THE BSI-12

**Table 4.** (continued)

*Comparison of women's clinical characteristics in the low- and high-risk of anxiety and depression groups based on the Brief Symptom Inventory (BSI-12)*

Variables	Low-risk depression (n = 37,201; 86.0%)		High-risk depression (n = 6,055; 14.0%)		$\chi^2$	$\chi^2$ tests		
	n	%	n	%		p	Phi	Cramer's V
Suffering from any mental illness or emotional problems?								
Yes	10,633	29.68	3,672	63.09	2,478.568	<0.001	0.244	0.244
No	25,192	70.32	2,148	36.91				
Suffering from any physical illness?								
Yes	7,140	19.96	1,380	23.71	43.276	<0.001	0.032	0.032
No	28,640	80.04	4,441	76.29				
Suffering from any sexual problems?								
Yes	2,679	7.51	794	13.69	248.082	<0.001	0.077	0.077
No	32,978	92.49	5,005	86.31				
Have you had thoughts of actually hurting yourself?								
Yes	10,986	31.19	4,058	70.82	3,331.089	<0.001	0.285	0.285
No	24,240	66.81	1,672	29.18				

*Note.* M = Mean; SD = Standard deviation; Mdn = Median. a: 1 = Among the worst; 2 = Much worse than average; 3 = Worse than average; 4 = Average; 5 = Better than average; 6 = Much better than average; 7 = Among the best. b: 1 = Not at all; 7 = Very much. c: 1 = No stress; 7 = Extreme stress. d: 0 = Not at all characteristic of me; 1 = Rather not characteristic of me; 2 = Somewhat characteristic of me; 3 = Characteristic of me; 4 = Entirely characteristic of me.

CROSS-CULTURAL VALIDATION OF THE BSI-12

**Table 5.**

*Comparison of gender-diverse participants' clinical characteristics in the low- and high-risk of anxiety and depression groups based on the Brief Symptom Inventory (BSI-12)*

Variables	Low-risk anxiety (n = 2,243; 86.9%)			High-risk anxiety (n = 338; 13.1%)			Mann-Whitney <i>U</i> tests			
	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>U</i>	<i>Z</i>	<i>p</i>	<i>r effect size</i>
Brief Symptom Inventory total score (BSI-12)	17.62	9.92	17.00	38.64	6.27	40.00	31,382.00	-27.231	<0.001	0.536
Anxiety Factor	8.12	4.96	8.00	20.51	2.10	20.00		-29.713	<0.001	0.585
Depression Factor	9.50	6.24	9.00	18.13	5.15	19.00	115,878.00	-20.626	<0.001	0.406
Valuation of life circumstances compared to others <sup>a</sup>	4.53	1.08	5.00	4.08	1.22	4.00	295,338.00	-6.744	<0.001	0.133
Emotionally affected by the COVID-19 pandemic <sup>b</sup>	4.49	1.63	5.00	4.92	1.69	5.00	297,680.00	-4.447	<0.001	0.089
Perceived stress related to the COVID-19 pandemic <sup>c</sup>	4.17	1.66	4.00	4.81	1.88	5.00	272,512.00	-6.641	<0.001	0.133
Compulsive Personality Assessment Scale total score <sup>d</sup>	14.27	5.04	14.00	16.96	5.33	17.00	265,841.50	-8.667	<0.001	0.171
Potential suicide risk (P4 Screener)	1.29	1.28	1.00	2.24	1.29	2.00	209,988.50	-11.798	<0.001	0.238

  

Variables	Low-risk anxiety (n = 2,243; 86.9%)		High-risk anxiety (n = 338; 13.1%)		$\chi^2$ tests			
	n	%	n	%	$\chi^2$	<i>p</i>	<i>Phi</i>	<i>Cramer's V</i>
Suffering from any mental illness or emotional problems?								
Yes	1,390	64.50	289	87.84	70.987	<0.001	0.169	0.169
No	765	35.50	40	12.16				
Suffering from any physical illness?								
Yes	569	26.29	111	33.84	8.178	0.004	0.057	0.057
No	1,595	73.71	217	66.16				
Suffering from any sexual problems?								
Yes	302	13.99	65	19.88	7.808	0.005	0.056	0.056
No	1,856	86.01	262	80.12				
Have you had thoughts of actually hurting yourself?								
Yes	1,280	60.00	271	84.16	70.150	<0.001	0.169	0.169
No	853	40.00	51	15.84				

  

Variables	Low-risk depression (n = 2,252; 87.3%)			High-risk depression (n = 329; 12.7%)			Mann-Whitney <i>U</i> tests			
	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>M</i>	<i>SD</i>	<i>Mdn</i>	<i>U</i>	<i>Z</i>	<i>p</i>	<i>r effect size</i>
Brief Symptom Inventory total score (BSI-12)	17.66	9.93	17.00	38.95	5.98	39.00	26,791.00	-27.227	<0.001	0.536
Anxiety Factor	8.69	5.69	8.00	16.92	5.33	17.00	114,001.00	-20.334	<0.001	0.400
Depression Factor	8.96	5.51	9.00	22.03	1.48	22.00		-29.368	<0.001	0.578
Valuation of life circumstances compared to others <sup>a</sup>	4.55	1.08	5.00	3.96	0.13	4.00	263,243.00	-8.766	<0.001	0.173
Emotionally affected by the COVID-19 pandemic <sup>b</sup>	4.52	1.63	5.00	4.74	1.73	5.00	311,809.00	-2.282	0.023	0.046
Perceived stress related to the COVID-19 pandemic <sup>c</sup>	4.20	1.67	4.00	4.62	1.86	5.00	288,277.00	-4.382	<0.001	0.088
Compulsive Personality Assessment Scale total score <sup>d</sup>	14.33	5.06	14.00	16.62	5.38	17.00	275,076.50	-7.411	<0.001	0.146
Potential suicide risk (P4 Screener)	1.25	1.25	1.00	2.56	1.26	3.00	156,663.50	-15.723	<0.001	0.317

CROSS-CULTURAL VALIDATION OF THE BSI-12

**Table 5.** (continued)

*Comparison of gender-diverse participants' clinical characteristics in the low- and high-risk of anxiety and depression groups based on the Brief Symptom Inventory (BSI-12)*

Variables	Low-risk depression (n = 2,252; 87.3%)		High-risk depression (n = 329; 12.7%)		$\chi^2$ tests			
	n	%	n	%	$\chi^2$	p	Phi	Cramer's V
Suffering from any mental illness or emotional problems?								
Yes	1,414	65.19	265	84.13	45.023	<0.001	0.135	0.135
No	755	34.81	50	15.87				
Suffering from any physical illness?								
Yes	575	26.41	105	33.33	6.643	0.010	0.052	0.052
No	1,602	73.59	210	66.67				
Suffering from any sexual problems?								
Yes	306	14.09	61	19.49	6.339	0.012	0.051	0.051
No	1,866	85.91	252	80.51				
Have you had thoughts of actually hurting yourself?								
Yes	1,281	59.64	270	87.95	92.545	<0.001	0.194	0.194
No	867	40.36	37	12.05				

*Note.* M = Mean; SD = Standard deviation; Mdn = Median. a: 1 = Among the worst; 2 = Much worse than average; 3 = Worse than average; 4 = Average; 5 = Better than average; 6 = Much better than average; 7 = Among the best. b: 1 = Not at all; 7 = Very much. c: 1 = No stress; 7 = Extreme stress. d: 0 = Not at all characteristic of me; 1 = Rather not characteristic of me; 2 = Somewhat characteristic of me; 3 = Characteristic of me; 4 = Entirely characteristic of me.

# CROSS-CULTURAL VALIDATION OF THE BSI-12

**Figure 1.**

Brief Symptom Inventory (BSI-12) raw scores by variables included in multigroup analysis. Error bars represent the 95% confidence interval, and sample sizes are depicted in parentheses.

