A Cross-Cultural Evaluation of Diener's Tripartite Model of Subjective Well-Being Across 16 Countries

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Abstract

Subjective well-being (SWB) is a multidimensional construct with three components (i.e., life satisfaction, positive affect, and negative affect) comprising the tripartite model. Yet, despite numerous studies in the field of SWB, the cross-cultural validity of the tripartite structure is still largely unknown. The present study evaluated competing models of SWB's structure across 16 countries ($N = 8860$ undergraduate students; age range = 18–29 years; 63.6% female) and examined its measurement invariance using both exact and approximate approaches. The exploratory structural equation model (ESEM) of tripartite SWB that allowed small cross-loadings provided the best fit to the data in the majority of countries, and it demonstrated a high level of approximate invariance, which allows for a comparison of means across countries. A bifactor model with an omitted Positive Affect factor also fit well in all samples making the measurement of the general SWB possible; however, it was less robust for cross-cultural comparisons. The correlations between the three latent SWB factors were consistent across most countries, with a few meaningful exceptions. We conclude that ESEM model represents the tripartite structure of SWB robustly both within and across countries.

Keywords: Subjective well-being; Assessment; Culture; Measurement invariance; Exploratory structural equation modeling; Alignment

1 Introduction

Subjective well-being (SWB) is typically conceptualized with Diener's tripartite model, in which SWB is posited as a multidimensional construct capturing cognitive (i.e., life satisfaction) and affective (i.e., positive affect and negative affect) components (Diener et al., 1999). Much work has relied on Diener's model as a conceptual framework to examine SWB's correlates, predictors, and outcomes in meta-analyses and reviews (e.g., Anglim et al., 2020; Bücker et al., 2018; Diener & Chan, 2011; Kuykendall et al., 2015; Luhmann et al., 2012; Ngamaba et al., 2018; Sánchez-Álvarez et al., 2016; Verduyn et al., 2017). Yet, despite its substantial empirical support, issues surrounding the conceptualization of SWB remain unresolved (Busseri & Sadava, 2011). A key problem involves its cross-cultural validity: Diener's model has been criticized as a Western-centric conceptualization of well-being reflecting cultural values such as hedonism and individualism (e.g., Christopher & Hickinbottom, 2008; Joshanloo, 2014). Although the research on cross-cultural differences in levels and determinants of SWB has grown in recent years (e.g., Diener et al., 2018; Suh & Choi, 2018), the cross-cultural invariance of the tripartite SWB structure remains largely unknown. Accordingly, the present study investigated the structure of SWB as conceptualized by Diener's tripartite model across 16 countries. Specifically, we evaluated alternative SWB model structures as measured by the Satisfaction with Life Scale (SWLS; Diener et al., 1985) and Scale of Positive and Negative Experience (SPANE; Diener et al., 2010) in samples recruited across four continents. We did not address the universality or cultural specificity of the meaning of the SWB construct but evaluated whether and to what degree the tripartite SWB structure, measured by the SWLS and SPANE, is invariant across countries.

1.1 Previous Findings on the Structure of SWB and Alternative Models of SWB Structure

Most studies investigating the structure of SWB were conducted on single-country samples (e.g., Albuquerque et al., 2012; Arthaud-Day et al., 2005; Chmiel et al., 2012; Jovanović, 2015). The oblique three-factor model (consisting of life satisfaction, positive affect, and negative affect latent factors) and different variants of models incorporating general or higher-order factor have been most often tested and supported in previous studies, but the results are difficult to generalize because questionnaires used to measure SWB components varied greatly. Although the SWLS and the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) are popular measures of cognitive and affective SWB components, modified versions of the PANAS have been used in studies on SWB structure (e.g., Albuquerque et al., 2012), as well as less commonly used scales such as Mroczek and Kolarz's (1998) Positive and Negative Affect Scales (Joshanloo, 2016a), Andrews and Withey's (1976) Life-3 Delighted-Terrible Scale, and Bradburn's (1969) Affect Scale (Arthaud-Day et al., 2005). Further, some studies used a single-item measure of life satisfaction instead of the 5-item SWLS (e.g., Busseri, 2015).

As noted, the tripartite structure of SWB has received robust empirical support, but it remains unclear to what extent this tripartite structure is cross-culturally generalizable. Prior studies suggest that the relationships between the affective and cognitive SWB components, as well as between positive and negative affect factors, vary across samples (e.g., Bagozzi et al., 1999; Kuppens et al., 2008; Spencer-Rodgers et al., 2010). Although the varying relationships between SWB components might be partially explained by factors such as time frames, item content, and response formats (Schimmack, 2008), there is increasing evidence that cultural factors may play a role. For example, the inverse correlation between positive and negative affect is typically stronger in individualistic and Western samples compared to East Asian samples (Jovanović et al., 2022a), and affective and cognitive components often yield stronger correlations in Western samples compared to non-Western samples (e.g., Rojas, 2021). Further, the use of the PANAS as a measure of affective component of SWB has often been criticized, especially regarding its suitability for cross-cultural research (e.g., Yaden & Haybron, 2022). The majority of items included in the PANAS capture high-arousal emotion states (e.g., enthusiastic, inspired, jittery, irritable; Tov et al., 2023) which might be more appropriate for the assessment of affective well-being in Western societies than in countries in which low-arousal states are culturally valued (such as in East Asia). The PANAS also does not include the most direct emotion indicators of well-being (i.e., sadness and happiness) which are among the most frequently recalled emotions that people use to describe their feelings (e.g., Li et al., 2020). Finally, the PANAS employs an intensity-based response format (from *Very slightly or not at all* to *Extremely*) that is often considered inferior to frequency-based response formats in the context of SWB measurement (Larsen & Eid, 2008).

Most studies that evaluated the structure of SWB to date used a conventional confirmatory factor analysis (CFA) approach, which relies on the restrictive factor model, not allowing item cross-loadings. Yet, this procedure does not do justice to theoretical assumptions and empirical findings on the nature of life satisfaction. For instance, despite a typical conceptualization of life satisfaction as a cognitive component of SWB, some authors posit that it is primarily an affective construct (see Jovanović & Joshanloo, 2022). Therefore, item cross-loadings are to be expected when examining the structure of SWB, such as positive affect items cross-loading onto the life satisfaction factor. Another potential limitation of CFA and not considering cross-loadings is the overestimation of latent factor correlations (Marsh et al., 2014). A recently developed statistical tool—exploratory structural equation modeling (ESEM; Asparouhov & Muthén, 2009; Marsh et al., 2009)—allows for small cross-loadings of indicators (e.g., life satisfaction items) on non-target latent factors (e.g., positive affect latent factor). ESEM keeps the overall factor structure simple and thus might be more flexible than a more restrictive standard CFA for examining the structure of SWB. Factor analysis in the ESEM integrates CFA and exploratory factor analysis (EFA) and combines the flexibility of EFA and several well-known statistical advances of CFA (e.g., Morin et al., 2020). The ESEM approach has been used in studies to examine the structure of well-being as measured by Mental Health Continuum-Short Form (Keyes et al., 2008) and proved to be a more accurate representation of emotional, psychological, and social well-being (see van Zyl & Ten Klooster, 2022). Some studies have applied ESEM to evaluate the structure of psychological well-being (e.g., Hsu et al., 2017) and social well-being (e.g., Khumalo et al., 2021), demonstrating the utility of ESEM for their respective well-being assessments. Surprisingly, only a few studies used ESEM in the context of Diener's tripartite model of SWB. For example, Joshanloo (2016a) compared several models of SWB across two Iranian samples using CFA and ESEM approaches and found that these models provided similar fit to the data. Further, across both samples the latent factor correlations between the three SWB components were only slightly lower in the ESEM model than in the CFA model, and only a few substantial cross-loadings were observed. Accordingly, Joshanloo (2016a) concluded that neither model be considered a superior representation of the SWB structure.

Some studies have also employed the bifactor modeling approach (see Reise, 2012) to test the structure of SWB and found support for it (e.g., Daniel-González et al., 2020; Jovanović, 2015). The bifactor model of SWB specifies a single general factor accounting for the common variance on all scale items and three specific—or group—factors (i.e., life satisfaction, positive affect, and negative affect) accounting for additional common variance among clusters of items (i.e., subdomains). Therefore, the bifactor model allows examination of not only the three conventional, specific factors of SWB, but also a general (i.e., common, shared) factor onto which all items used to assess SWB in a study load. Moderate correlations typically found between affective and cognitive components of SWB (e.g., Busseri, 2018) suggest that life satisfaction and positive and negative affect might reflect a single overarching dimension of positive evaluations of life experiences. Thus, a bifactor representation of SWB seems theoretically and empirically justified because it assumes the existence of a general construct underlying all indicators included in life satisfaction and positive/negative affect questionnaires. However, despite the popularity of bifactor modeling (e.g., Chen et al., 2013; Kaufman et al., 2022; Longo et al., 2016), it should be approached with caution when used for evaluating the structure of complex psychological domains such as SWB. As argued by Bonifay et al. (2017), "bifactor models are methodologically controversial due to their difficult interpretability and tendency to overfit data" (p. 185), and their utility in examining the structure of psychological constructs appears more ambiguous than their application for understanding psychometric properties of multidimensional scales.

Some limitations of testing bifactor models using the traditional CFA approach can be overcome by applying the bifactor-ESEM framework: a combination of bifactor and ESEM approaches made possible by recent developments in psychometrics (Morin et al., 2016). We argue that the bifactor-ESEM model is well-suited for evaluating Diener's tripartite model of SWB for two reasons. First, because affective and cognitive evaluations of life are closely associated, ratings of target constructs (e.g., positive affect) are likely to be associated with non-target, but conceptually related, constructs (e.g., life satisfaction). Second, a bifactor representation of SWB is theoretically justified, and co-existence of global and specific dimensions of SWB can be expected. Thus, the bifactor-ESEM model of SWB enables the assessment of two sources of construct-relevant multidimensionality (e.g., Morin et al., 2020): one related to conceptual relationships between SWB components, and the other related to hierarchical ordering of SWB components. To date, a bifactor-ESEM model has never been applied to Diener's tripartite model in cross-cultural studies. However, there is a theoretical rationale to expect that this model is well-suited for testing the structure of SWB, and it has been tested in several studies evaluating the structure of other types of well-being (e.g., Fadda et al., 2017; Longo et al., 2020; Rogoza et al., 2018; Żemojtel-Piotrowska et al., 2018).

1.2 The Present Study

The goal of the present study was to evaluate the structure of SWB as measured by the SWLS and SPANE across diverse countries and contribute to a cross-cultural understanding of Diener's tripartite conceptualization of SWB. We utilized the SWLS as the most commonly used scale of general life satisfaction and the SPANE due to its advantages over other measures of the affective component of SWB. The SPANE has gained popularity in SWB research over the past years given its (a) inclusion of both specific (e.g., happy, contented, afraid, angry) and general (e.g., positive, pleasant, negative, unpleasant) emotion terms, which cover a wide range of positive and negative emotional experiences using only 12 items; (b) ability to assess a broader range of valence and arousal of emotional experience (e.g., high-arousal and low-arousal negative emotions such as anger and sadness, respectively, as well as high-arousal and low-arousal positive emotions such as joy and contentment, respectively); and (c) use of a frequency-based response scale (instead of an intensity-based response scale), which is more appropriate for SWB assessment (Diener et al., 2010). Another reason for choosing the SWLS and SPANE to test the structure of SWB includes the fact that both scales were developed and guided by Diener's tripartite approach to SWB. Although the SWLS and SPANE have been employed jointly in dozens of studies across various cultures (e.g., Busseri et al., 2018), only a few studies have tested the structure of SWB as measured by the SWLS and SPANE (e.g., Kyriazos et al., 2018; Rice & Shorey-Fennell, 2020), and none have examined the cross-cultural validity of the tripartite structure of SWB as measured by these two scales.

2 Method

2.1 Sample and Procedure

The sample included 8860 undergraduate students (age range = 18–29 years, 63.6% female) from 16 countries (China, Greece, India, Indonesia, Italy, Japan, Mexico, the Philippines, Poland, Romania, Serbia, Slovenia, South Africa, Turkey, United Arab Emirates [UAE], and USA). Two samples were recruited in India (one completed measures in English and the other in Hindi), thus a total of 17 samples were used. Gender, age, and size of each sample, language used, mode of administration, and year of data collection are described in the Supplementary Materials (Table S1).

We relied on secondary data from 16 samples obtained using convenience sampling, whereas the English language sample from India was recruited in 2022 specifically for the present study. The first author conducted a non-systematic literature search (using the search terms "Satisfaction with Life Scale" and "Scale of Positive and Negative Experience") on Google Scholar, Web of Science, and Scopus for studies that used both the SWLS and SPANE in the same sample. After identifying relevant studies, coauthors were contacted for collaboration. Several requirements were set: (1) for non-English versions of the survey, official translations of the SWLS and SPANE had been used to collect the data (i.e., versions developed using the back-translation procedure); (2) a five-item SWLS with a 7-point response scale, and a 12-item SPANE with a 5-point response scale had been used (i.e., the original versions of the scales were administered); (3) informed consent had been obtained from participants, and data were collected in accordance with protocols from institutional or other relevant ethics committee; and (4) only undergraduate students, aged 18–29 years were included. The decision to focus on undergraduate students maximized the number of countries for our analyses, as these samples were most frequently endorsed. The age range was also restricted to 18–29 years (i.e., emerging adulthood) to minimize age differences between samples and avoid potential developmental differences. Researchers from 16 countries agreed to share their data.

2.2 Measures

The Satisfaction with Life Scale (SWLS; Diener et al., 1985) is a 5-item measure of global life satisfaction. Items (e.g., "So far I have gotten the important things I want in life") were rated on a seven-point scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Internal consistency (Cronbach's α and McDonald's ω [1]) of the SWLS in the present study was adequate in all samples (α range: 0.79–0.91; ω range: 0.81–0.91), except in the Indian Hindi sample ($\alpha = 0.53$, $\omega = 0.56$) (see Table S2).

The Scale of Positive and Negative Experience (SPANE; Diener et al., 2010) is a 12-item questionnaire designed to assess positive emotional experiences (SPANE-P scale items: *positive, good, pleasant, happy, joyful,* and *contented*) and negative emotional experiences (SPANE-N scale items: *negative, bad, unpleasant, sad, afraid*, and *angry*). Participants report how frequently they experience each of the 12 feelings over a 4-week period. Items were rated on a five-point scale from 1 (*very rarely or never*) to 5 (*very often or always*). Internal consistencies of the SPANE-P and SPANE-N in the present study were as follows: $\alpha_{\text{SPANE-P}}$ range: 0.69-0.93; $\omega_{\text{SPANE-P}}$ range: 0.70–0.93; $\alpha_{\text{SPANE-N}}$ range: 0.69–0.87; $\omega_{\text{SPANE-N}}$ range: 0.71–0.87 (see Table S2).

2.3 Data Analysis

Given the existing research, we focused on testing whether bifactor and ESEM models provide better factor solutions compared to a simple three-factor CFA (Model 1) with correlated factors indicating Life Satisfaction, Positive Affect, and Negative Affect. We considered a classic bifactor-CFA model (Model 2a) with a general factor and three group factors, all uncorrelated with each other. Since the uncorrelated factors are hard to interpret (e.g., it is not clear what the Life Satisfaction factor would represent if it does not correlate with Positive Affect and Negative Affect factors), we considered versions of the bifactor model that allowed correlations between group factors, namely, a fixed bifactor-CFA model (Model 2b) and the S-1 bifactor-CFA model (Model 2c). Fixed bifactor-CFA model (also referred to as random intercept item factor analysis, Maydeu-Olivares & Coffman, 2006) retains all group factors and allows correlations between them but fixes all the common factor's loadings to 1 instead of estimating them freely. Since the common factor is forced to load positively on both positive and negative affect as well as on life satisfaction items, the meaning of the common factor is different – instead of representing a general SWB, it is likely to represent responding tendencies. [2] The bifactor S-1 factor model (Eid et al., 2017) is a bifactor model which excludes one of the group factors and allows correlations between the remaining group factors (but not with the general factor).

Other than bifactor models, we focused on the CFA within ESEM framework (Model 3a; hereafter referred to as the three-factor ESEM model), which included three correlated factors and all possible cross-loadings rotated toward 0 using the target rotation. Its extension, a fixed bifactor-CFA within ESEM framework (Model 3c; hereafter referred to as the fixed bifactor-ESEM) appended a standard ESEM with a general factor (Model 3b), whose unstandardized loadings were fixed to 1. Likewise, the S-1 factor model can be extended to the ESEM framework by adding all the possible cross-loadings of the remaining two group factors (Model 3d; the S-1 bifactor-ESEM model). The structures of these models are illustrated in Fig. 1.

We evaluated the fit of these models and the interrelations of three SWB factors. The analytic strategy included several steps. First, we ran each of the models within every sample and evaluated their fit, which helped to identify the best fitting model. To present a general pattern of results, we also report the fit of these models on the pooled sample. Second, we tested each model for its measurement invariance across 17 samples. Finally, we examined correlations between the latent factors across the samples to test for discriminant validity.

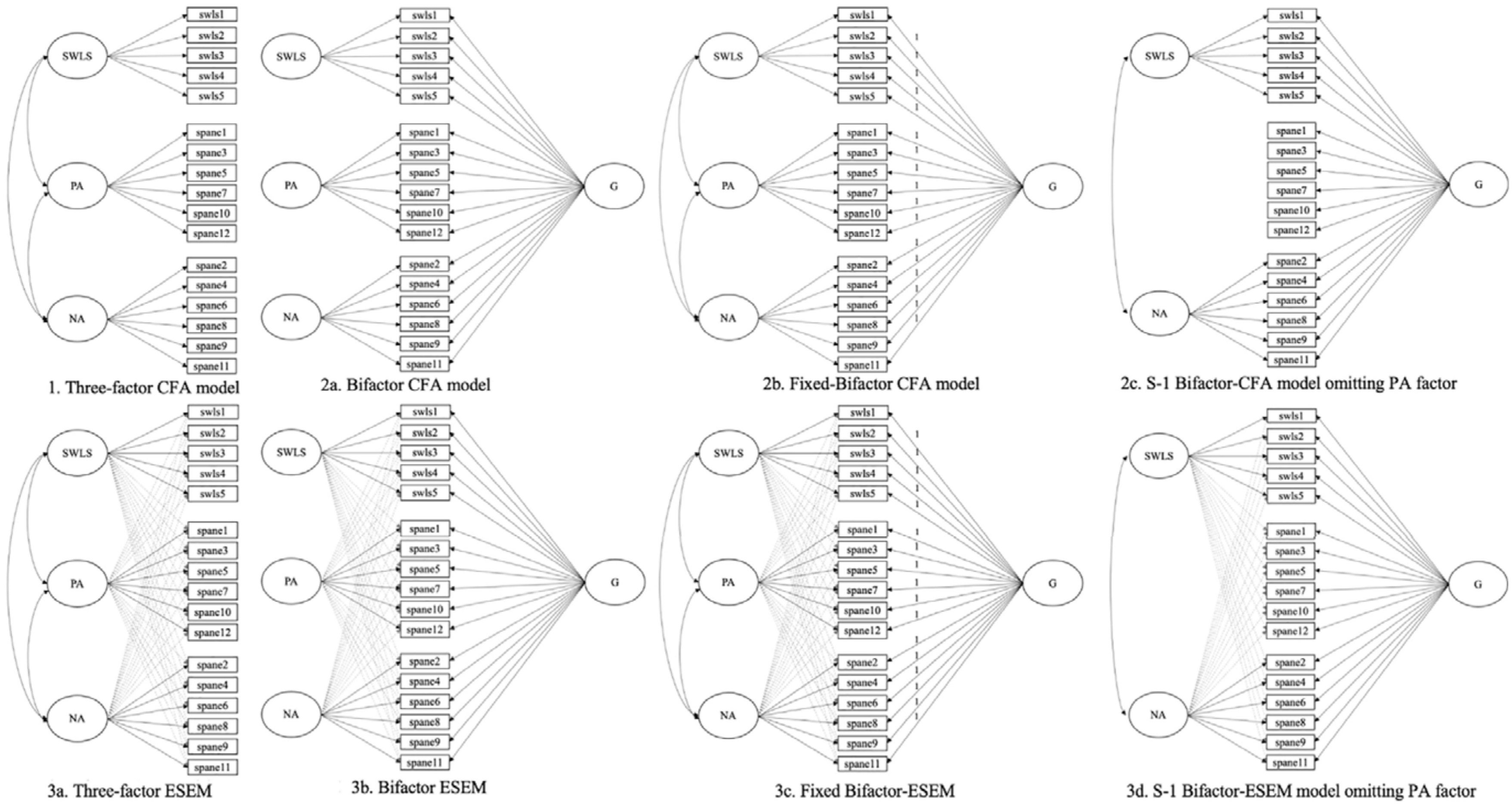

Fig. 1. Structure of the Subjective Well-Being Models. Note. SPANE = Scale of Positive and Negative Experience. SWLS = Satisfaction with Life Scale. PA = Positive Affect measured from the Scale of Positive and Negative Experience. NA = Negative Affect measured from the Scale of Positive and Negative Experience. G = General factor. CFA = Confirmatory Factor Analysis. ESEM = Exploratory Structural Equation Modeling. Solid lines from factors to items indicate direct loadings. Dotted lines from factors to items indicate potential cross-loadings. Bidirectional lines indicate covariances between factors

The fit of the model was regarded acceptable when CFI (Comparative Fit Index) > 0.90, RMSEA (Root Mean Square Error of Approximation) and SRMR (Standardized Root Mean Squared Residual) < 0.08; and it was good when CFI > 0.95 and RMSEA and SRMR < 0.05 (Brown, 2015). To test for measurement invariance, we used Chen's (2007) criteria to detect a substantial difference in fit (ΔCFI > 0.01; ΔRMSEA > 0.015; ΔSRMR > 0.03 for comparison of configural and metric invariance models and a cutoff of 0.01 for all the fit indices to compare metric and scalar invariance). We also considered information criteria for model comparison for the non-nested models. Lower values of aBIC (Sample-Adjusted Bayesian Information Criterion) and AIC (Akaike Information Criterion) indicate better model fit. Bifactor models were additionally assessed with ancillary indices, namely explained common variance, percent of uncontaminated correlations, and Omega hierarchical (Rodrigez et al., 2016).

All the models were estimated using robust maximum likelihood (MLR) method, which shows stable results under slight non-normality. Accordingly, chi-square comparisons were performed with a scaling factor (hereafter—likelihood ratio test [LRT]; Satorra & Bentler, 2010). The models were run using Mplus 8.10 software (Muthén & Muthén, 1998-2017). Missing values comprised less than 1% of cases and were treated with full information maximum likelihood (FIML) in all models. We assumed all the indicators to be continuous. All code and data are available at the Open Science Framework here: https://osf.io/n6d8h.

3 Results

3.1 Comparison of the Competing Factor Models

3.1.1 CFA and Bifactor Models

All models fit the data well in every country in line with CFI, RMSEA, and SRMR. A simple three-factor CFA model showed high fit in each sample (Table S3); all the factor loadings were significant and strong (98% of standardized loadings were greater than 0.40), and the correlations between factors were mostly fairly sized and had expected signs (except for the two Indian samples where correlations between the Negative Affect factor and the two remaining SWB components were small and non-significant, and Turkey where the correlations between the Life Satisfaction factor and the two affect factors were weaker than in the other samples).

The conventional bifactor-CFA model revealed negative or non-significant variance of the Positive Affect factor in nine samples; negative Life Satisfaction factor variance in another two, a negative item residual in Poland; and it did not converge in Mexico, India (Hindi), and South Africa (see Table S4). The only non-problematic models were estimated in Slovenia and the Philippines, and even in these two samples, some loadings on the Positive Affect factor were non-significant, and its variance was relatively small (e.g., after refitting the model using *z*-standardized items in Slovenia, variances of Positive Affect, Negative Affect, Life Satisfaction, and the common factor were 0.13, 0.20, 0.42, and 1, respectively). Therefore, the classic bifactor-CFA model was problematic in virtually every sample.

Since the classic bifactor-CFA model consistently estimated a non-significant Positive Affect factor, we first ran the S-1 bifactor-CFA model omitting the Positive Affect factor (for the models omitting Life Satisfaction and Negative Affect factors, see Table S5) and allowing the Negative Affect and Life Satisfaction factors to correlate. [3] The resulting model fit well in all the samples (see Table S6). The differences in most fit indices of this model and the simple three-factor CFA were, however, very small and negligible (in most countries, CFI, RMSEA, and SRMR changed less than 0.01, see Table S7), whereas aBIC substantially increased in half of the samples pointing to a worse fit. Overall, the S-1 bifactor-CFA model was not better than the more parsimonious three-factor CFA with possible exceptions of Serbia, Slovenia, and Romania.

The fixed bifactor-CFA model converged in each sample, fit the data well, and overall was less problematic compared to the classic bifactor-CFA model (Table S8). Nevertheless, in four samples, the fixed bifactor-CFA model estimated a negative variance of the common factor. Variance of the method factor was significant in only six samples (India [English], Italy, Japan, the Philippines, South Africa, and UAE). In Italy and UAE, the correlation between Positive Affect and Negative Affect was estimated to be lower than -1 suggesting overestimated variance of the method factor.

The direct comparison of the three-factor CFA and the fixed bifactor-CFA models within each sample demonstrated predominantly similar fit to the data indicating only negligible improvement after adding the common factor (i.e., CFI, RMSEA, and SRMR changed less than 0.01 after adding the general factor to the CFA model; see Table S9). Therefore, following the parsimony rule, we conclude that the CFA model without a fixed common factor is preferable in virtually all samples (with a possible exception of the India-English sample).

In the pooled sample, the models showed similar results. The differences between models with and without the general factor were relatively small. The fit indices listed in Table 1 demonstrate that among Models 1-2c, in line with AIC and aBIC, the simple three-factor CFA model should be preferred, whereas CFA, RMSEA, and SRMR demonstrated only negligible differences. In the classic bifactor-CFA model, Positive Affect's variance and loadings were extremely small and non-significant. In the fixed bifactor-CFA model, the method factor had a significant but very small variance (0.04; compared to variances of Life Satisfaction, Positive Affect, and Negative Affect: 0.54, 0.53, and 0.58, respectively, based on a model with prior *z*-standardized indicators), and the standardized factor loadings on the general factor were all below 0.20. The S-1 bifactor-CFA model omitting the Positive Affect factor did not encounter any statistical issues. It seems that the bifactor models are an unnecessary complication, and a simpler three-factor CFA has a sufficiently good fit to the data while being the most parsimonious and conceptually clear.

3.1.2 Three-Factor ESEM

As noted, ESEM is a version of CFA allowing for small cross-loadings. The ESEMs estimated within each sample fit the data well (see Table S10) and did not show any artifacts or errors. Similar to the three-factor CFA model, the correlations between factors were moderate to strong and had an expected sign, with exceptions of the two Indian samples where the Negative Affect factor did

Table 1. Models fit indices for pooled data

Model	χ^2	df	CFI	RMSEA [90% CI]	SRMR	AIC	aBIC
Model 1: Three-Factor CFA	1463.13	116	.973	.036 [.035, .038]	.028	360,787.2	360,998.4
Model 2a: Bifactor-CFA	1185.25	102	.978	.035 [.033, .036]	.024	406,763.8	407,029.8
Model 2b: Fixed Bifactor-CFA	1443.30	115	.973	.036 [.034, .038]	.026	407,106.4	407,321.5
Model 2c: S-1 Bifactor-CFA Omitting Positive Affect	1312.68	107	.976	.036 [.034, .037]	.023	406,974.5	407,221.0
Model 3a: Three-Factor ESEM	924.12	88	.983	.033 [.031, .035]	.014	406,530.5	406,851.3
Model 3b: Bifactor-ESEM	664.47	74	.988	.030 [.028, .032]	.012	406,174.6	406,550.1
Model 3c: Fixed Bifactor-ESEM	900.84	87	.984	.032 [.031, .034]	.015	406,407.3	406,731.9
Model 3d: S-1 Bifactor-ESEM Omitting Positive Affect	903.11	86	.984	.033 [.031, .035]	.014	360,200.8	360,529.4

df = degrees of freedom; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; SRMR = Standardized Root Mean Squared Residual; AIC = Akaike Information Criterion; aBIC = Sample-Adjusted Bayesian Information Criterion; CFA = Confirmatory Factor Analysis; ESEM = Exploratory Structural Equation Modeling. All χ^2 values have $p < .001$

not correlate significantly with the other factors and lower correlations observed in Turkey. Compared to the simple CFA model, ESEM estimated consistently lower correlations between the latent factors, yet the differences were relatively small (0.04 on average). Examination of the standardized loadings showed the expected pattern. In the ESEM, expected factor loadings were consistently high—96% of standardized loadings were higher than 0.40—and only one out of a possible 578 cross-loadings among 17 samples was higher than 0.40 (see Table S11).

Next, we compared ESEM to CFA models within each country (see Table S12). LRTs point to a significantly better fit ($p < 0.01$) of the ESEM in all but four samples. In China, Poland, Mexico, and Turkey, the differences were non-significant. In ESEM models, CFI was also substantially higher (> 0.01) than in CFA models in 12 out of 17 samples. Likewise, RMSEA, SRMR, as well as AIC showed improvement of the fit when comparing CFA to ESEM models in most samples. Overall, we can conclude that in the majority of samples, ESEM was preferable.

In the pooled sample, differences between CFA and ESEM models were substantial (ΔCFI = 0.010, ΔSRMR = 0.014, ΔRMSEA = 0.003, but ΔaBIC = 45,853, see Table 1). LRT was also significant (Table S13); however, this was likely caused by the large sample size. Standardized factor loadings in the ESEM pooled model were all higher than 0.50 for the intended indicators, and lower than 0.20 for the cross-loadings (see Table S14), revealing a factor structure that aligns well with the theory.

3.1.3 Bifactor-ESEM

Next, we explored the fixed bifactor-ESEM and S-1 bifactor-ESEM models (setting aside the classic bifactor-ESEM as grossly overparameterized). [4] The S-1 bifactor-ESEM model in the pooled sample revealed a general factor that loaded positively on all items (with somewhat higher on Positive Affect items), which suggests that this common factor did not indicate a general SWB but was rather similar to the one in the fixed bifactor-CFA model—likely capturing a response style. This model did not converge in 10 out of 17 samples.

Fixed bifactor-ESEMs showed a god fit to the data in most samples (Table S15), but also indicated several issues with the estimated parameters. In three samples, some variances were estimated negative. The number of loadings of a substantial magnitude was smaller than in the ESEM models (see Table S16). The target loadings were greater than 0.40 in only 65% of cases, whereas 8% of cross-loadings were higher than absolute 0.40. Importantly, fixed bifactor-ESEM models underestimated the Negative Affect factor with small and highly unstable loadings across samples. For example, the standardized loading of SPANE item 2 (*negative*) on the Negative Affect factor was 0.31 in China, −0.94 in Greece, and −0.08 in Japan. Such results suggest that Negative Affect items did not require their own specific factor after controlling for the response tendencies (i.e., the common factor) and cross-loadings from Positive Affect and Life Satisfaction factors. Moreover, the variance of the common factor was very small (0.09 on average compared to the variances of 1 for the group factors). Such results suggest that the general factor did not contribute much to the explanation of the covariance between indicators in virtually all samples in the study.

Table S17 lists the differences between the ESEM models with and without the common fixed factor. LRT was non-significant (p > 0.01) in seven countries, significant in seven countries favoring the bifactor-ESEM model, and in three samples the test was not available (these models were not nested because in some of them, the residuals were fixed). Adding a common factor improved the model fit in seven samples in terms of CFI, in four samples with RMSEA, and in none with SRMR. The information criteria, in contrast, showed improvement in fit in most samples. To sum up, in about half of the samples, the ESEM model did not improve after adding the general fixed factor.

In the pooled sample, the differences between ESEMs with and without the general factor were relatively small. CFI did not improve at all after adding the general factor to the ESEM model. [5] The standardized factor loadings on the general factor were all lower than 0.29 in the fixed bifactor-ESEM model. Therefore, given the modest improvement of fit and the confusing pattern of factor loadings in the bifactor-ESEM, we conclude that the ESEM model without the general factor is preferable.

Overall, introduction of the general factor in both CFA and ESEM, and subsequently identifying a bifactor model, is questionable and likely unnecessary. Utilization of ESEM, however, resulted in a substantial improvement of model fit due to inclusion of many small cross-loadings. Critically, introduction of the general factor to the ESEM model led to multiple problems in different samples questioning its comparability across samples. Therefore, we proceeded with the ESEM model.

3.2 Testing Measurement Invariance of the ESEM

Measurement invariance testing is usually conducted within the framework of the multi-group CFA, whereas multi-group ESEM is less clear. Preliminary analysis showed that the factor loadings might be unstable when the fully exploratory model is used. [6] For this reason, we rotated only the cross-loadings with a target value of zero. Such a model was identified by fixing factor variances to 1, whereas none of the factor loadings were fixed, and by assuming one intercept per factor to be invariant across groups.

The test of the exact invariance model followed three steps. First, we tested a configural model that evaluates whether the factor structure is generally similar across the samples. Second, the metric invariance model tested whether the factor loadings are the same in all the samples. Third, the scalar invariance model constrained both factor loadings and item intercepts to equality, respectively, across groups. Table 2 shows that both configural and metric invariance models fit the data well; however, the differences in CFI were larger than recommended. Therefore, full exact metric invariance was rejected, as was the full scalar invariance. In contrast, RMSEA and SRMR showed only a smaller decline in model fit, whereas aBIC showed a model improvement suggesting the metric model should be preferred.

Table 2. Three-factor ESEM exact invariance tests

Invariance Model	χ^2	df	CFI	RMSEA [90% CI]	SRMR	AIC	aBIC
Configural	3342.06	1496	.965	.049 [.046, .051]	.026	342,465.5	347,918.1
Metric	5036.36	2168	.946	.050 [.049, .052]	.052	343,101.7	345,925.8
Scalar	9636.21	2392	.863	.076 [.075, .078]	.075	347,996.6	349,944.5
Model Comparisons							
Configural vs. Metric	1694.30	672	-.019	.001	.026	636.2	-1992.3
Metric vs. Scalar	4599.85	224	-.083	.026	.023	4894.9	4018.7

df = degrees of freedom; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; SRMR = Standardized Root Mean Squared Residual; AIC = Akaike Information Criterion; aBIC = Sample-Adjusted Bayesian Information Criterion. All χ^2 values have $p < .001$

Table 3. Three-factor ESEM alignment (weighted average unstandardized parameters across invariant groups)

Items	Intercepts			NA Loadings			PA Loadings			LS Loadings		
	Est	R^2	*k* noninv	Est	R^2	*k* noninv	Est	R^2	*k* noninv	Est	R^2	*k* noninv
SPANE1 (Positive)	.13	.89		−.08	.02		**.62**	.72		.03	< .01	
SPANE3 (Good)	.09	.90		−.05	< .01		**.58**	.67	1	.02	< .01	
SPANE5 (Pleasant)	.11	.90	2	−.02	< .01		**.66**	.58	1	−.01	< .01	
SPANE7 (Happy)	.10	.90	4	<|.01|	.03		**.76**	.56		<|.01|	< .01	
SPANE10 (Joyful)	.15	.69	4	.04	< .01		**.76**	< .01		−.03	< .01	
SPANE12 (Contented)	.17	.69	6	<|.01|	< .01	1	**.49**	.19	3	.13	.07	3
SPANE2 (Negative)	−.16	.96		**.67**	.79		−.08	.08		−.01	< .01	
SPANE4 (Bad)	−.21	.93	3	**.69**	.72		−.02	< .01		.01	.02	
SPANE6 (Unpleasant)	−.12	.94	2	**.66**	.74		−.02	.02	1	.02	< .01	
SPANE8 (Sad)	−.14	.84	2	**.64**	.72		.00	< .01		−.04	.09	
SPANE9 (Afraid)	−.10	.48	8	**.45**	< .01	1	.06	< .01		−.03	.01	
SPANE11 (Angry)	.00	.37	7	**.53**	.16		.04	.03		.02	< .01	1
SWLS1 (In most ways my life is close to my ideal)	.28	.83	4	<|.01|	< .01	1	.01	.03		**.58**	.56	1
SWLS2 (The conditions of my life are excellent)	.22	.80	7	−.01	.02		.01	< .01	1	**.59**	.79	
SWLS3 (I am satisfied with my life)	.24	.93	1	−.02	.03		.04	< .01		**.64**	.81	1
SWLS4 (So far, I have gotten the important things I want in life)	.25	.81	4	.02	< .01		.04	< .01		**.54**	.81	
SWLS5 (If I could live my life over, I would change almost nothing)	.27	.70	4	−.03	< .01		.01	.01		**.45**	.59	1

Est = aligned parameter; R^2 = measure of invariance of the current parameter based on the association between the parameter and the factor mean across-group variabilities; *k* noninv = number of countries in which the parameter was not invariant. NA = Negative Affect; PA = Positive Affect; LS = Life Satisfaction. Factor loadings above .40 are marked in bold. In total, 7% parameters were non-invariant. Fit indices: Comparative Fit Index = .965; Root Mean Square Error of Approximation = .049; Standardized Root Mean Square Residual = .026

3.3 Testing Approximate Measurement Invariance

The rejection of the exact invariance tests prevents mean and covariance comparisons across countries. A newly introduced alignment procedure for ESEM (Asparouhov & Muthén, 2023) may address this issue by estimating an approximately invariant model and providing approximately comparable factor mean estimates.

Table 3 shows the results of the alignment. Overall, only 7% of the parameters were non-invariant, which is below the recommended cutoff of 25% (Muthén & Asparouhov, 2014). This result supports approximate invariance, which allows the comparison of means. Non-invariant intercepts contributed 5% to this share, whereas factor loadings were virtually all approximately invariant. The least invariant parameters were intercepts of SWLS item 2 (*The conditions of my life are excellent*), and SPANE items 9 (*afraid*), 11 (*angry*), and 12 (*contented*). The pattern of aligned loadings is very clear: the focal loadings were all greater than 0.40, and the cross-loadings were close to zero with a maximum magnitude of 0.08. Interestingly, intercepts for positive affect and life satisfaction were positive, while those for negative affect were negative. This points to an overall tendency to express more positive self-states and suppress negative ones. The lower invariance of the negative affect indicator intercepts suggests that the suppression of negative self-states is less universal. For instance, the intercept of SPANE item 9 (*afraid*) was positive in China, Japan, and the Philippines, but negative in Greece, Italy, Slovenia, and Serbia (see Table S18).

The correlations estimated by the alignment model (Table 4) were close to the expected values; in virtually every country, positive affect and life satisfaction correlated negatively with negative affect, and positive affect correlated positively with life satisfaction. Overall, the correlations were medium to high except for the two Indian samples, in which negative affect had non-significant correlations with both positive affect and life satisfaction and Turkey where negative affect did not significantly correlate with life satisfaction. Besides those cases, the cross-country differences in the correlations between factors were small. Excluding India, the correlation between negative and positive affect ranged between −0.31 (Japan) and −0.78 (Greece) (average $r = -0.57$; $SD = 0.11$); the correlation between negative affect and life satisfaction ranged between −0.13 (Turkey) and −0.59 (Slovenia) (average $r = -0.42$; $SD = 0.11$); and the correlation between positive affect and life satisfaction ranged between 0.29 (Turkey) and 0.69 (in Italy and South Africa) (average $r = 0.58$; $SD = 0.10$).

Table 4. Correlations estimated by three-factor ESEM alignment

Country	NA with PA	NA with LS	PA with LS
China	−.62	−.39	.55
Greece	−.78	−.53	.67
India (English)	−.09	.07	.73
India (Hindi)	.11	.00	.46
Indonesia	−.52	−.48	.68
Italy	−.69	−.54	.69
Japan	−.31	−.36	.48
Mexico	−.52	−.30	.55
Philippines	−.59	−.46	.62
Poland	−.45	−.37	.54
Romania	−.48	−.42	.57
Serbia	−.61	−.43	.53
Slovenia	−.68	−.59	.61
South Africa	−.60	−.40	.69
Turkey	−.51	−.13	.29
UAE	−.56	−.36	.55
USA	−.65	−.49	.64

NA = Negative Affect; PA = Positive Affect; LS = Life Satisfaction. All correlations are significant at $p < .001$ except NA with PA in India (both English and Hindi samples; $p = .166$ and .049, respectively), as well as NA with LS in India (both English and Hindi samples) and Turkey ($p =$ .446, .738, and .026, respectively).

3.4 Testing Measurement Invariance of the Other Models

We also tested multiple group models for the alternative models that allowed testing their measurement invariance. The configural invariance model fit the data well for the three-factor CFA, the S-1 bifactor-CFA model, as well as fixed bifactor-CFA, but it did not converge for the classic bifactor-CFA model (see Table S19). The fit of the configural ESEM model was the highest in terms of CFI, SRMR, aBIC, and the same in terms of RMSEA. Three-factor CFA and fixed bifactor-CFA tests supported partial metric invariance with relaxed constraints on loadings of SPANE item 5 (*pleasant*) and SWLS item 5 (*If I could live my life over, I would change almost nothing*) (Tables S20 and S21). Exact invariance of the S-1 bifactor-CFA model without the Positive Affect factor was rejected, and even when partial metric invariance was tested (equivalent loadings on general factor but non-equivalent loadings on Negative Affect and Life Satisfaction), the model fit dropped too much (compared to the configural model, ΔCFI = 0.019, ΔRMSEA < 0.001; ΔSRMR = 0.055; see Table S22). Therefore, only configural invariance held. Alignment for the three-factor CFA model and the S-1 bifactor-CFA model with the omitted Positive Affect factor revealed 17% of non-invariant parameters (Table S19), which is still within the threshold of 25% and overall supports approximate invariance. As mentioned above, the three-factor ESEM alignment showed 7% of non-invariant parameters, which is much lower than in other models. In sum, the ESEM model showed greater invariance across the samples.

4 Discussion

Diener's tripartite model (Diener, 1984; Diener et al., 1999) conceptualizes SWB as a multidimensional construct encompassing three related, yet distinct, components: life satisfaction, positive affect, and negative affect. Although previous findings supported both multidimensional and bifactor structures of SWB across various samples, with both shared and unique aspects of cognitive (life satisfaction) and affective (positive affect and negative affect) components, the cross-cultural validity of the tripartite conceptualization of SWB remained understudied. The present research tested competing structural models of SWB across samples from 16 countries by using modern analytic approaches to fill this gap.

We found only limited evidence for a meaningful general factor of SWB as assessed by SWLS and SPANE. The introduction of the general factor to the tripartite model turned out to be an overparameterization. This result contrasts with studies that used the SWLS and PANAS instead of SPANE (e.g., Jovanović, 2015; Nima et al., 2020), or included measures of domain satisfaction and happiness (e.g., Kaufman et al., 2022), and identified the underlying general SWB factor. It appears that whether a meaningful general factor of SWB will be detected depends on the measures used to assess SWB components. Nevertheless, the S-1 bifactor-CFA model without a Positive Affect factor was less problematic and fit the data as closely as the simple three-factor CFA. These results imply that such a model (general SWB + correlated Life Satisfaction and Negative Affect factors) might be a useful tool for the representation of the general SWB structure, which challenges the notion of the distinctiveness between the three components of Diener's SWB model. However, the specific factors appear conceptually murky within this model; the Life Satisfaction and Negative Affect factors are uncorrelated with a general SWB factor and load on the same indicators. These findings suggest that these factors are not related to SWB and, instead of representing affect and life satisfaction, indicate the commonality of residuals due to the same scale or domain. In practice it means that they cannot be unambiguously used to indicate negative affect or life satisfaction and rather should not be named as such.

Our findings indicated that both the three-factor CFA model and the ESEM model fitted the data well in all countries. However, allowing small cross-loadings resulted in an improvement of model fit in most countries, except China, Mexico, Poland, and Turkey. These results suggest that allowing for cross-loadings in the SWB models can lead to a more precise representation of SWB structure. Due to close associations and interplay between affective and cognitive evaluations (e.g., Berlin & Connolly, 2019), it is both theoretically and empirically justified to expect that the items indicating life satisfaction could partly reflect affective factors and vice versa. Our study, like previous works (e.g., Iasiello et al., 2022; Joshanloo et al., 2016b), demonstrated the usefulness of the ESEM approach to study well-being in most but probably not all countries (as noted, the conventional three-factor CFA model was preferred in four countries). Nevertheless, the ESEM model showed its usefulness as a convenient way to avoid nuisance cross-country differences in establishing a comparable measure of SWB.

In terms of measurement invariance and an overall appropriateness for comparisons across countries, ESEM demonstrated the best results. Thanks to its accommodation of the small cross-loadings (which are substantively negligible but deteriorate the model fit when fixed to zero), it showed the best fit of the configural model.

The alignment approach to testing for approximate measurement invariance of the ESEM model of SWB across countries provided more nuanced results compared to a traditional multi-group CFA. The ESEM alignment procedure supported the approximate invariance of the tested model. The least invariant parameters were SWLS item 2 (*The conditions of my life are excellent*), and SPANE items 9 (*afraid*), 11 (*angry*), and 12 (*contented*). The SWLS item 2 was found to be non-invariant in several other cross-cultural studies focusing on the measurement invariance of the SWLS (e.g., Jang et al., 2017; Jovanović et al., 2022b), indicating that the meaning of “life conditions” might vary across cultures (for further explanation, see Jovanović et al., 2022b). Three additional SWLS items (item 1: *In most ways my life is close to my ideal*; item 4: *So far I have gotten the important things I want in life*; and item 5: *If I could live my life over, I would change almost nothing*) were non-invariant in four countries each, which is also in line with previous findings (e.g., Emerson et al., 2017).

Non-invariance of affective indicators of fear and anger is consistent with previous studies (e.g., Jovanović et al., 2022a) and supports the cross-cultural differences in conceptualization, value, and experience of emotions (e.g., De Leersnyder et al., 2021; De Vaus et al., 2018), as well as differences in semantics of these terms across languages (e.g., Jackson et al., 2019). We found that people with the same level of negative affect are more prone to report feeling fearful in Asian compared to European countries. On the other hand, at the same level of negative affect, participants in several Asian countries, as well as in Slovenia and USA, were less prone to report feeling angry compared to participants in Romania, Turkey, and Mexico. These findings portray possible cross-cultural differences in adherence to emotion norms, which are still poorly understood (Vishkin et al., 2023) and difficult to interpret. Although both fear and anger are high-arousal emotions, expected to be more culturally valued and more frequently expressed by people in Western cultures (Lim, 2016; Tsai, 2021), fear experiences (not expression) might be more acceptable in Asian countries due to a dialectical understanding of emotions. Based on the principles of dialecticism (i.e., change, contradiction, and holism; Wilken & Miyamoto, 2018), one might expect that the experience of fear would be interpreted as a normal and acceptable part of life in Asian countries, contrary to European and Western contexts in which negative emotions are interpreted as a threat to one's sense of self, and thus undesirable and should be avoided (e.g., Park et al., 2020). Therefore, non-invariance of emotion terms such as *angry* and *afraid* is not surprising, given the ways in which socio-cultural processes shape the experiences and meaning of emotions (e.g., Mesquita et al., 2016). We also found evidence for non-invariance of the SPANE item *contented*, which was not observed in a cross-national study on measurement invariance of the SPANE across 13 countries (Jovanović et al., 2022a). However, a term such as *contented* might hold a slightly different meaning across languages, capturing emotion experiences that vary in arousal level. For example, in the English language, contentment is typically conceptualized as an emotion closely associated with other low-arousal positive emotions, such as serenity, calmness, and satisfaction (e.g., Haslam, 1995); however, *satisfaction* and *contentment* are considered distinct experiences. On the other hand, languages such as Polish, Serbian, and Slovenian use the same word for satisfaction and contentment (*zadovoljstvo* both in Serbian and Slovenian; *zadowolenie* in Polish), and thus *contented* might refer to same experiences as *satisfied*. Despite these minor differences, we emphasize that the main message is that the tripartite model of SWB was predominantly invariant across 16 countries.

Correlations between the latent SWB factors (estimated by the alignment ESEM model) were similar in signs and magnitude across most countries. Correlations between the two positive SWB constructs (i.e., life satisfaction and positive affect) varied the least across countries, whereas the correlations between the two affective components, as well as between negative affect and life satisfaction, were considerably lower in the Indian samples compared to the remaining countries. Although the SPANE includes four pairs of items that can be considered semantic opposites in English (positive–negative, good–bad, pleasant–unpleasant, happy–sad), weak correlations were found between positive and negative affect in Indian Hindi and English language samples. A similar correlation between SPANE-P and SPANE-N in India (−0.11) was also observed in Jovanović et al. (2022a), suggesting greater independence of the two affective dimensions in an Indian cultural context, and supporting previous observations about cross-cultural differences in emotions between Eastern and Western cultures (Schimmack, 2009). However, our findings also suggest that these differences cannot generalize to all Eastern and Western cultures, as the negative correlations between two affective dimensions in China, the Philippines, and Indonesia were comparable to those observed in most countries. Given the restricted range of countries sampled in our study, these findings warrant replication. Future studies may consider which socio-cultural factors contribute to varying relationships between positive and negative emotions (Schimmack et al., 2002), as well as investigate the impact of response patterns (e.g., acquiescence bias) on the estimated correlations between the two affective SWB dimensions, as cultural differences in survey responding might distort these correlations (Baumgartner & Weijters, 2015).

4.1 Limitations and Future Directions

The present research is the first to investigate competing structural models of SWB using standard CFA, bifactor, and ESEM approaches in a cross-cultural perspective, but several limitations are noteworthy. First, SWB was measured using only two questionnaires (SWLS and SPANE). The SWLS is a measure of global life satisfaction, so future studies should attempt to replicate our results with questionnaires designed to assess satisfaction with specific life domains (e.g., Personal Well-Being Index; International Well-Being Group, 2013). In addition, the SPANE includes a limited number of positive and negative emotional experience descriptors, so additional testing of whether our findings could be replicated using different measures of affective well-being (such as the PANAS or the Geneva Emotion Wheel; Scherer, 2005) is warranted. Second, only undergraduate students aged 18–29 years were included, making generalizability to individuals in other developmental stages difficult. As the structure of emotional experiences might differ across age groups (e.g., Charles et al., 2019), understanding of the SWB structure would benefit from an inclusion of adolescents, middle-aged, and older adults. Third, our sample included participants from 16 countries and four continents, but only one country from Africa (i.e., South Africa) and Latin America (i.e., Mexico), respectively. Including a wider range of countries across the globe, especially those underrepresented in psychological research (Tindle, 2021), is needed. Fourth, the literature search for relevant studies that used the SWLS and SPANE was non-systematic, and several suitable datasets were not included (e.g., authors did not respond or accept an invitation to collaborate), which further limits our findings' generalizability. Fifth, we focused exclusively on the structure of SWB; we did not test associations between SWB global and specific factors with other variables. To further evaluate the distinction between global and specific components of SWB, future studies should investigate their associations with well-established correlates, predictors, and outcomes of SWB. Finally, as we did not investigate potential sources of measurement non-invariance (such as gender; modes of administration; and various social, economic, and cultural factors), future studies should attempt to identify such sources of non-invariance.

5 Conclusion

Our findings indicate that the structure of SWB as measured by SWLS and SPANE shows a high degree of similarity across countries, and that the tripartite conceptualization of SWB allowing for cross-loadings appears to be the best representation of SWB data in most countries. The ESEM model performed best for the representation of the tripartite model within and across different samples, whereas the S-1 bifactor-CFA model with the omitted Positive Affect factor might be a promising avenue for investigating the nature of general SWB, especially at the within-country level of analysis.

Our results have important implications for future cross-cultural SWB research. Our findings add to the growing body of evidence suggesting that both the SWLS and SPANE as measures target the same (or highly similar) respective constructs across cultures. This implies that researchers interested in studying Diener's model of SWB cross-culturally can rely on these measures as appropriate tools for measuring SWB. However, given the lack of exact invariance of some SWLS and SPANE items, testing measurement invariance of the SWB structure is necessary prior to making cross-national comparisons of predictors, correlates, or mean levels of SWB. In other words, to make valid cross-cultural comparisons, measurement invariance of these two scales should not be assumed but tested. Our findings also support multidimensionality and domain specificity of SWB constructs as measured by the SWLS and SPANE and indicate that a single general component cannot explain the majority of variance in SWB's affective and cognitive components. Finally, our findings should by no means lead to inferences about cultural universality of Diener's tripartite model of SWB. Measurement invariance assesses the psychometric equivalence of a construct across groups and cannot uncover cultural meanings of psychological constructs, including those closely related to SWB.

Data availability

All code and data are available at the Open Science Directory by the link https://osf.io/n6d8h.

Notes

1. Omega was based on the simplest single-factor CFA models.
2. Please note that due to differences in response scales, fixing all the loadings to one resulted in a slightly higher contribution of SPANE items to the common factor.
3. From a theoretical point of view, it is unclear whether Negative Affect and Life Satisfaction factors should correlate in this case, as in the classic bifactor model they represented "residual factors" meant to accommodate for the not-so-meaningful covariance beside the common SWB factor. In the S-1 model, allowing for the correlation, these residual factors can be correlated, and it may make them meaningful representations of negative affect and life satisfaction, but then the meaning of the uncorrelated general factor turns out unclear – if the general factor represents general SWB then it must correlate with Negative Affect and Life Satisfaction. The correlations between Negative Affect and Life Satisfaction in this model were small, negative (except for India-English), and occasionally significant (see Table S6). We additionally ran the models with the uncorrelated Negative Affect and Life Satisfaction factors and got virtually the same results with negligibly lower fit indices.
4. Indeed, in the pooled sample, the classic bifactor-ESEM model was problematic in several ways: it estimated non-significant factor loadings on the Positive Affect factor and a negative residual variance of one of the indicators.
5. Likewise, ancillary indices showed a relatively weak common factor. Explained common variance estimated in the CFA, ESEM, and the fixed bifactor-CFA was .07, .12, and .57, respectively; percent of uncontaminated correlations for all models was .71; and Omega hierarchical was .17, .32, and .41, respectively, indicating a fair degree of multidimensionality.

6. The inclusion of the fully exploratory ESEM in the alignment procedure was problematic. In particular, the flexibility of ESEM combined with alignment made the "label switching" possible where the same labels were assigned to different factors. For instance, what was identified as the Life Satisfaction factor in Japan had weak loadings on life satisfaction indicators (despite the target set for them), whereas these same indicators loaded on the Positive and Negative Affect factors, thus representing a bipolar positive vs. negative affect dimension.

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Contributions

Veljko Jovanović and Maksim Rudnev contributed equally by conceptualizing, performing analyses, and writing the manuscript, and thus both should be considered first authors. All other authors contributed to investigation and data curation. All authors read and approved the final manuscript.

Ethics declarations

Conflict of interest

Jesus Alfonso D. Datu serves as a Co-Editor in the Psychology Area of Journal of Happiness Studies. Other authors have no relevant financial or non-financial interests to disclose.

Ethics Approval

The data were collected in accordance with protocols from institutional or other relevant ethics committees.

Informed Consent

Informed consent had been obtained from all participants.

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