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Positive and Negative Emotional Experiences in Adolescents across 32 Countries: Cross-National and Gender Differences

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Abstract

Despite a growing interest in adolescent subjective well-being, cross-cultural research on positive and negative affect in adolescents has been surprisingly scarce. Moreover, a cross-cultural evaluation of affective well-being measures in adolescents has lagged behind research in adults. The present study evaluated the cross-national and gender invariance of the Scale of Positive and Negative Experience (SPANE), using adolescent samples from 32 countries ($N=17,489$; age range=14–19) spanning five continents. The original two-factor structure of the SPANE was supported in 29 of the 32 countries. We could establish partial metric invariance of the SPANE across countries and full or partial scalar invariance across gender in 18 and 11 countries, respectively. The alignment method showed evidence for approximate invariance across countries, allowing for cross-national means comparisons of positive and negative affect. In most countries, girls reported higher levels of negative affect, and no substantial gender differences in positive affect were observed. Cross-national differences in mean levels of positive and negative affect yielded complex findings. Our results suggest that the SPANE is a solid candidate for measuring emotional experiences among adolescents in large-scale cross-national studies.

Keywords Emotions · Culture · Adolescence · Positive affect · Negative affect · Gender · Measurement invariance

Introduction

Positive and negative emotional experiences (positive affect [PA] and negative affect [NA] hereafter) are considered key subjective indicators of human well-being (e.g., Das et al., 2020; Diener et al., 1999) and “core features of the human condition” (Ryff, 2003, p. 156). Therefore, it is not surprising that the assessment of PA and NA has recently become a widespread practice in large-scale international studies such as the Gallup World Poll (GWP) and the Programme for International Student Assessment (PISA). Lists of countries with the lowest and the highest PA and NA have been published yearly over the past decade (e.g., Gallup, 2015, 2024), attracting broad media attention and coverage (e.g., Kluger, 2024; “World is angry and stressed, Gallup report says,” 2019). However, research on the cross-cultural validity of questionnaires designed to assess PA and NA has been remarkably scarce (e.g., Raudenská, 2020), especially in adolescent samples. To address this gap in the literature, the present study aims to provide evidence on the cross-national measurement invariance of the Scale of Positive and Negative Experience (SPANE; Diener et al., 2010) in adolescent samples recruited across 32 countries. In addition, given insufficient evidence on the equivalence of affective well-being measures across gender in adolescents, we also examined the gender invariance of the SPANE.

Assessment of Positive and Negative Emotional Experiences in Multinational Studies

There are several well-established self-report measures designed to assess PA and NA, but the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) has been by far the most popular and widely used in psychological research. The original paper describing the development of the PANAS has been cited more than 30,000 times in SCOPUS by the middle of 2025, making it one of the classics in psychology. However, the use of the PANAS in cross-cultural research has been mostly limited to two-country studies in adult samples (e.g., Davis et al., 2022; Lee et al., 2020; Pethtel & Chen, 2010; Weidong et al., 2004). There are several possible reasons for the limited use of the PANAS in large, multi-country studies. First, although it consists of only 20 items, it is not brief enough to warrant inclusion in large-scale studies, which typically target a large number of constructs. Second, it is dominated by emotion terms referring to high-arousal states (e.g., excited, enthusiastic, upset, hostile, jittery), which are more valued in the Western cultural contexts (Tsai & Clobert, 2019), making the PANAS a questionable choice for cross-cultural research. Finally, it has problematic content validity as it comprises several non-emotional terms (e.g., alert, active, strong) and does not include several common positive and negative emotion words (e.g., sad, happy, angry, joyful). Other well-known emotion self-reports, such as the Multiple Affect Adjective Check List–Revised (MAACL-R; Zuckerman et al., 1983) and the Profile of Mood States (POMS; McNair et al., 1971) have also been sparsely used in cross-cultural studies, likely due to their length and difficulties in translating some items into different languages.

Given such problems with existing scales, most large-scale, cross-national studies have used ad hoc measures of PA and NA, which also face a number of issues. For example, recent waves of the GWP included a set of four items assessing people's recent experiences ("Did you feel well-rested yesterday?"; "Were you treated with respect all day yesterday?"; "Did you smile or laugh a lot yesterday?"; and "Did you learn or do something interesting yesterday?") and seven items assessing feelings of enjoyment, calmness, physical pain, worry, sadness, stress, and anger (e.g., Lomas et al., 2025). However, different authors use different sets of GWP items to generate measures of PA and NA, leading to varying operationalizations of PA and NA across studies, hindering the comparability of findings. For example, Gallup's Global Emotions Report (e.g., Gallup, 2024; see also Marquez et al., 2024 for a study on a sample of middle adolescents) derives a positive emotions scale (termed Positive Experience Index in the Report) from five items (enjoyment, smile/laughter, well-rested, treated with respect, and learned) and a negative emotions scale (termed Negative Experience Index) from five items (pain, sadness, worry, anger, and stress). In contrast, Blanchflower and Bryson (2024a) summed three (enjoyment, smile/laughter, and well-rested) and four variables (pain, sadness, worry, and anger) to construct PA and NA variables, respectively. Finally, Joshanloo and Jovanović (2021) used only enjoyment and smile/laughter as indicators of PA and a set of four negative emotions (worry, sadness, stress, and anger), which has been frequently used when defining NA variable using the GWP data (e.g., Melios et al., 2023). Another example of an ad hoc scale is the Positive and Negative Affect Scale (CW-PNAS) used in the International

Survey of Children's Well-Being (ISCWeB), also known as the Children's Worlds, a multinational survey of 8-, 10-, and 12-year-olds (Rees et al., 2020). The ISCWeB assesses PA and NA in two older groups with three items each (happy, calm, and full of energy for PA; and sad, stressed, and bored for NA), whereas only "happy" and "sad" are used among 8-year-olds (Rees et al., 2020)¹. As a final example, the PISA 2018 survey used a total of nine items to assess emotional well-being, with five PA items (happy, lively, proud, joyful, and cheerful) and four NA items (scared, miserable, afraid, and sad), but the choice of PA and NA indicators has not been uniform across studies (Courtney et al., 2023).

There are several problems with these ad hoc scales. First, the theoretical rationale for the development of the scales is often vague and the emotion theories underlying the approach to the assessment of emotional experiences remain largely unknown. For example, the ISCWeB's use of six emotion terms is justified merely by stating that they "reflect activated, deactivated, and neutral affect as proposed by Feldman Barrett & Russell (1998)" (Rees et al., 2020, p. 25). Second, these scales are often used without providing convincing evidence of their validity and reliability for assessing PA and NA among adolescents. Finally, studies using these scales typically fail to evaluate their cross-national measurement invariance, leaving an open question regarding the degree to which group comparisons are valid and unbiased and whether these scales are appropriate tools for cross-cultural research (e.g., Fischer & Rudnev, 2025).

Although it remains understudied, cross-cultural research on adolescent affective well-being has increased over the past decade. However, the differences between studies in indicators (i.e., emotion terms) used to assess PA and NA hinder the comparability of study findings. With this in mind, there is a pressing need for a cross-cultural evaluation of established, psychometrically sound measures of PA and NA in adolescent samples that might be suitable for large-scale international studies. Given the potential problems with using the PANAS in cross-cultural studies (e.g., Wedderhoff et al., 2021), the present study focuses on the SPANE, a relatively novel, promising measure of PA and NA for cross-cultural research.

The Scale of Positive and Negative Experience

The SPANE is a 12-item scale comprising two subscales: Positive Feelings or Positive Emotional Experience (SPANE-P; items: positive, good, pleasant, happy, joyful, and contented) and Negative Feelings or Negative Emotional Experience (SPANE-N; items: negative, bad, unpleasant, sad, afraid, angry). The scale was developed by Diener et al. (2010) to overcome the abovementioned limitations of the PANAS and to offer a brief scale that would cover a broad range of positive and negative emotional experiences that would be suitable for research in different cultural contexts. As argued by Diener et al. (2010), the inclusion of six general positive and negative terms (e.g., pleasant, unpleasant) "allows the SPANE to reflect the full range of emotions and feelings that a respondent might feel, both bad and good, without creat-

¹ The Children's Worlds study conducted during the COVID-19 pandemic on samples of 7–15-year-old children included the same set of six items for measuring affective well-being.

ing a list of hundreds of items to fully reflect the diversity of positive and negative feelings” (p. 145). In addition, six specific emotions were chosen to reflect different arousal levels from low (e.g., sad, contented) to high (e.g., happy, angry) and to cover the major emotions from different theories of emotion.

The SPANE has several features that make it a promising tool for cross-cultural research on adolescent affective well-being. First, with only 12 items, it is a brief, simple-to-administer scale that uses easy-to-understand single-word terms. The latter makes the process of translating the SPANE into different languages straightforward, as there are not many alternative linguistic solutions for the included terms. Second, it includes general evaluative terms (e.g., good, bad) and specific emotion terms (e.g., happy, afraid) that are considered to have a high degree of cross-cultural universality and which are present in most languages (e.g., Goddard & Wierzbicka, 2014; Saucier et al., 2014). Third, it covers both low-arousal and high-arousal emotional experiences, which are differently valued across cultures (Tsai & Clobert, 2019).

The SPANE has received extensive psychometric evaluation across various countries, providing convincing evidence for the reliability and validity of its scores (including incremental, convergent, and discriminant validity; e.g., du Plessis & Guse, 2017; Jovanović, 2015; Jovanović et al., 2020), as well as for a robust two-factor structure (see Tov et al., 2022 for a review). It has also undergone psychometric evaluation in adolescent samples (e.g., Jovanović, 2015; Prado-Gascó et al., 2020; Singh, Junnarkar, et al., 2016), with psychometric qualities comparable to those found in studies on adult samples. Most importantly, the SPANE has been used in several multi-country studies (e.g., Kormi-Nouri et al., 2013; Singh, Jain, et al., 2016; Yaaqeb et al., 2022), although cross-national measurement invariance, to our knowledge, has been evaluated only very recently and in only two studies to date. Jovanović, Joshanloo, et al. (2022) tested the measurement invariance of the SPANE in adult samples across 13 countries (China, Colombia, Germany, Greece, India, Italy, Japan, Poland, Portugal, Serbia, Spain, Turkey, and the United States), and found that three items measuring specific negative emotions (sad, afraid, and angry) operated differently across countries. Jovanović, Rudnev, et al. (2022) examined measurement invariance of the SPANE among adolescents aged 15–19 years from three countries (India, Poland, and Serbia), finding that only the item “afraid” showed evidence of noninvariance. In both studies, the correlations between the SPANE-P and SPANE-N were negative, but the magnitude of correlations varied greatly (ranging from -0.11 to -0.82), with the weakest negative correlations observed in Asian countries (China, India, and Japan).

Cross-National and Cross-Gender Differences in Mean Levels of PA and NA Among Adolescents

Most international, large-scale studies examining cross-national and gender differences in subjective well-being have been conducted in adult samples, focusing more often on measures of life satisfaction than PA and NA (e.g., Batz-Barbarich et al., 2018; York & Bell, 2014). Despite some inconsistencies, the vast majority of studies have found that gender differences in life satisfaction and PA are small, whereas women typically report higher levels of NA than men (e.g., Batz & Tay,

2018; Blanchflower & Bryson, 2024b; Joshanloo & Jovanović, 2020; Meisenberg & Woodley, 2015; Zuckerman et al., 2017). Cross-national comparisons of subjective well-being have revealed a more complex pattern of results. Individuals in more economically developed countries consistently report higher levels of life satisfaction than people in poorer countries (e.g., Diener et al., 2018), whereas country differences in PA and NA are more puzzling and depend on the indicators used to assess affective well-being (e.g., Blanchflower & Bryson, 2024a). For example, the data from the GWP in recent years (e.g., Gallup, 2022, 2023, 2024) show that the highest PA is reported in Latin America and Southeast Asia, while the highest NA is found in war-torn countries (Afghanistan, Iraq, and Lebanon) or those in Sub-Saharan Africa. Lists of countries with the lowest levels of PA and NA are perplexing and typically include a mixture of countries from Europe, Asia, and Africa. Nonetheless, some findings are relatively consistent. For example, low NA is often observed in countries from Central Asia and former Soviet republics, whereas low PA is typically found in some Asian countries (Bangladesh, Nepal, and Turkey) and many countries with ongoing armed conflicts (e.g., Ethiopia, Yemen, and Lebanon).

In contrast to numerous studies on the role of culture and gender in adults' subjective well-being, there is a scarcity of research on cross-cultural and gender differences in emotional experiences among adolescents. These studies typically yield results comparable to those found among adult samples regarding gender differences (e.g., Campbell et al., 2021), but the findings on cross-national differences in adolescent PA and NA are conflicting. For example, some authors argue that adolescents in economically developed countries, on average, report higher PA and lower NA than adolescents in less affluent societies (e.g., Marquez et al., 2024), whereas others report a negative association between economic development and adolescent subjective well-being (e.g., Rudolf & Bethmann, 2023). However, most studies in this field fail to test measurement invariance of the measures used to assess adolescent PA and NA (e.g., Esidio et al., 2023; Marquez et al., 2024), questioning the validity of the findings.

The Present Study

The main goals of the present study were threefold.

First, we examined the cross-national measurement invariance of the SPANE using adolescent samples recruited across 32 countries covering five continents. In the absence of a widely accepted measure of adolescent PA and NA, and in view of a dearth of cross-cultural studies on affective well-being among adolescents, we aimed to contribute to the field of subjective well-being by evaluating whether the SPANE—one of the most widely used scales in the assessment of emotional experiences among adults (Tov et al., 2022)—is suitable for cross-cultural adolescent research. Understanding of cross-national differences in levels and correlates of adolescent affective well-being is still limited and hampered by a lack of attention to measurement invariance, a pervasive problem in psychological research (e.g., Maassen et al., 2023). Since we are still a long way from having a robust body of comparable cross-cultural findings on adolescent emotional experiences, having a cross-culturally valid measure of PA and NA in adolescence is critical and a necessary first step to advancing this field.

Second, we investigated gender invariance of the SPANE to evaluate whether its items function similarly among boys and girls from diverse world regions. Given the rising concerns about the gender gap in adolescent mental health, with girls reporting lower well-being than boys (Campbell et al., 2021), and the pressing need to understand gender differences in PA and NA across the globe (Blanchflower & Bryson, 2024b), the availability of gender-invariant measures is essential.

Finally, we tested mean differences in PA and NA across countries and gender to evaluate whether the results typically found in adult samples also hold true for adolescent samples.

Method

Sample and Procedure

A total of 17,489 adolescents aged 14–19 years from 32 countries participated in the present study. The data originates from an international research collaboration, which is a part of the larger project entitled “Identity orientations and mental health in adolescence: Examining the roles of basic psychological needs and culture (IDIOMATIC)”. Sample sizes ranged from 200 in Austria to 1,150 in Hungary ($M=547$; $Mdn=509$). The data were collected from April 2023 to June 2024. Table 1 presents sample size, language, administration mode (paper-and-pencil or online), and sociodemographic characteristics (gender and age) in each country. A detailed description of the sampling procedure can be found in Jovanović et al. (2025). The only inclusion criteria was age between 14 and 19 years, and there were no exclusion criteria for participating in the survey. The researchers in each country obtained approval for the study from their respective Institutional Review Board or Ethical Committee. Informed consent was granted from all participants included in the study.

Instruments

We used the Scale of Positive and Negative Experience (SPANE; Diener et al., 2010), a 12-item questionnaire designed to assess two dimensions of emotional experiences: positive and negative, as described in the Introduction section. Responses are made on a Likert-type scale ranging from 1 (*very rarely or never*) to 5 (*very often or always*). Participants are asked to report the frequency of their emotional experiences during the past four weeks.

The original English version of the SPANE was used in Canada and South Africa (see <https://labs.psychology.illinois.edu/~ediener/SPANE.html>), whereas, in the remaining countries or regions, the scale was translated into the native language of that country or region (see Table 1). Either a standard back-translation procedure or a committee approach was used (see van de Vijver & Leung, 2021).

Data Analysis

We first evaluated a one-factor CFA model with all items loading on a single factor and a correlated two-factor CFA model with six items (positive, good, pleasant,

Table 1 Sample characteristics broken down by country

Country	<i>N</i>	% female	Mean age	Age range	Language	Administration mode
Austria	200	73.5	16.80	15–18	German	Online
Bangladesh	500	50.2	16.85	14–19	Bangla	Paper-and-Pencil
Bosnia and Herzegovina	500	64.6	17.09	14–19	Bosnian	Paper-and-Pencil
Canada	514	72.2	17.36	15–18	English	Online
Chile	503	49.9	17.81	16–19	Spanish	Online
Colombia	504	56	16.30	15–19	Spanish	Paper-and-Pencil
Croatia	537	78.4	17.28	14–19	Croatian	Online
Cuba	801	65.4	16.41	14–18	Spanish	Online
Estonia	514	56.8	16.54	15–18	Estonian	Online
France	410	63.9	15.99	15–18	French	Online
Germany	487	74.3	17.21	15–18	German	Online
Hungary	1150	53.4	16.39	14–19	Hungarian	Online
India	554	57.6	16.74	14–19	Hindi	Online
Indonesia	506	56.9	16.51	14–19	Indonesian	Online
Iran	500	56.6	16.00	15–18	Farsi	Both
Italy	387	56.6	16.59	14–19	Italian	Online
Japan	500	50	16.54	15–18	Japanese	Online
Lithuania	507	54.8	16.13	14–19	Lithuanian	Online
Macau	530	46	16.33	15–18	Chinese	Online
Mexico	606	58.3	16.71	14–19	Spanish	Both
Montenegro	559	68.3	16.99	15–18	Montenegrin	Paper-and-Pencil
Netherlands	305	60.7	17.06	16–19	Dutch	Online
North Macedonia	710	60.3	16.80	14–19	Macedonian	Online
Peru	500	48.6	15.68	15–18	Spanish	Paper-and-Pencil
Poland	510	79	17.47	15–18	Polish	Online
Portugal	422	66.5	16.20	14–19	Portuguese	Online
Romania	565	51.7	16.68	14–19	Romanian	Paper-and-Pencil
Serbia	1099	55.7	16.03	15–19	Serbian	Paper-and-Pencil
Slovenia	556	55.4	16.32	15–18	Slovenian	Online
South Africa	494	48.6	16.70	14–19	English	Paper-and-Pencil
Spain	532	61.8	16.70	14–19	Spanish	Online
Turkey	527	43.8	16.10	14–18	Turkish	Paper-and-Pencil

happy, joyful, and contented) loading on the PA factor and six items (negative, bad, unpleasant, sad, afraid, and angry) loading on the NA factor in each country separately and the pooled sample. We expected to find support for the two-factor model, but we also tested the fit of the one-factor model as the most parsimonious model, especially since the factor structure of the SPANE was not previously tested in many countries included in the present study. For transparency, we report the results using both the robust maximum likelihood (MLR) and the weighted least square mean and variance adjusted (WLSMV) estimator deemed appropriate for continuous and ordered categorical data, respectively (Brauer et al., 2023). The Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI) $\geq 0.90/0.95$, and the upper bound values of the Root Mean Square Error of Approximation (RMSEA) 90% confidence interval (CI) $\leq 0.10/0.05$ were considered acceptable/good fit, respectively (Wang & Wang, 2020).

Second, we evaluated cross-national and gender measurement invariance. Measurement invariance across gender was tested in each country separately. We started with a standard multi-group procedure for testing exact invariance, using a 3-step approach (configural and scalar invariance) for analyses with the WLSMV and the 4-step approach (configural, metric, and scalar invariance) for analyses with the MLR estimator (Bowen & Masa, 2015). The metric invariance step was omitted in a 3-step approach because factor loadings and thresholds should be tested in tandem when items are considered ordinal (e.g., Sass et al., 2014). Following convention, cut-off values of 0.01 for ΔCFI and 0.015 for $\Delta RMSEA$ were used when comparing invariance models (Chen, 2007; Cheung & Rensvold, 2002).

Since scalar invariance is often considered unrealistic to achieve in large cross-cultural studies with many groups (e.g., Marsh et al., 2018), we also evaluated approximate invariance across countries by employing the alignment optimization method (Asparouhov & Muthén, 2014). This method is based on the configural model and uses the simplicity function to minimize cross-group differences in item parameters (e.g., intercepts and loadings), which is optimized for a minimal number of large noninvariant parameters and many approximately invariant parameters (Pokropek, 2024). In line with recommendations (e.g., Luong & Flake, 2023) and previous cross-cultural applications (e.g., Byrne & van de Vijver, 2017), we used the free alignment approach, in which factor means in all groups are estimated freely (in contrast to the fixed approach in which the factor mean in the reference group is fixed to 0). A tentative cut-off of 25% noninvariant items, proposed by Muthén & Asparouhov (2014), was used to evaluate the trustworthiness of the alignment results.

For comparison purposes, we report both Cronbach's alpha (α) and McDonald's omega (ω) as indicators of internal consistency. Although α is the most commonly used measure of reliability, it has a number of well-known limitations, leading authors to recommend the use of ω rather than α (e.g., Hayes & Coutts, 2020).

Mplus 8.11 (Muthén & Muthén, 1998–2017) was used in all analyses. Syntaxes and data are available on the Open Science Framework website: <https://osf.io/wg7ae/>. The default algorithms in Mplus and the full information maximum likelihood (FIML) were used for handling missing data using the WLSMV and MLR, respectively.

Results

Factor Structure of the SPANE in Each Country Separately

The one-factor model provided a poor fit to the data in all countries (see Table S1 in the Supplementary Material). Table S2 in the Supplementary Material presents the model fit indices for the two-factor CFA solution obtained using the MLR and WLSMV estimators. As the pattern of results was similar across the two estimators, we focused on the MLR for simplicity and ease of reading. The two-factor CFA model provided an acceptable or good fit to the data based on the CFI/TLI and RMSEA values (90% upper limit) in all countries except Indonesia, Lithuania, and Macau. After allowing correlated errors between two pairs of items in Indonesia

(“sad” and “afraid”; “happy” and “joyful”) and Lithuania (“good” and “pleasant”; “bad” and “unpleasant”), the modified models achieved an acceptable fit to the data (only the TLI value for Lithuanian data was marginal). No meaningful modifications led to substantial improvement in the model fit in Macau.

Standardized factor loadings for the two-factor solution are reported in Tables S3 (for MLR) and S4 (for WLSMV), whereas the internal consistency indices are shown in Table S5. In most countries, all items had strong loadings on their theoretically espoused factors. Item 9 (“afraid”) and item 11 (“angry”) consistently had the lowest loadings on the NA factor, yet these were above 0.40 in the vast majority of countries.

Internal consistency of SPANE-P and SPANE-N was adequate in all countries except Macau and Turkey. In Macau, similar internal consistencies were found among girls ($\alpha_{PA}=0.56$, $\omega_{PA}=0.57$; $\alpha_{NA}=0.62$, $\omega_{NA}=0.64$) and boys ($\alpha_{PA}=0.54$, $\omega_{PA}=0.55$; $\alpha_{NA}=0.62$, $\omega_{NA}=0.64$), whereas in Turkey, internal consistency was substantially higher among girls ($\alpha_{PA}=0.63$, $\omega_{PA}=0.64$; $\alpha_{NA}=0.61$, $\omega_{NA}=0.62$) than boys ($\alpha_{PA}=0.48$, $\omega_{PA}=0.48$; $\alpha_{NA}=0.38$, $\omega_{NA}=0.40$).

Given a good fit of the two-factor model to the Turkish data, we decided to retain the Turkish data in the subsequent analyses, but these findings should be taken with caution due to the low internal consistency of the SPANE subscales in Turkey.

Correlations between PA and NA across Countries

The correlations between PA and NA latent factors varied considerably across countries (Table 2). The weakest correlations were found in Japan ($r=.02$), South Africa ($r=-.16$), and India ($r=-.17$). In Bangladesh, the correlation was positive ($r=.20$), whereas in the remaining countries (without Macau) the correlations were negative and ranged between -0.36 (Portugal) and -0.75 (Croatia).

Cross-National Measurement Invariance

The results of cross-national invariance testing using a standard multi-group procedure across 31 countries (without Macau) are reported in Table 3. Findings obtained using both MLR and WLSMV estimators are reported, but for simplicity, we focus on the MLR results. As shown, the configural model provided a good fit to the data. The metric model resulted in a deterioration of model fit ($\Delta CFI=-0.012$). Item 3 (“good”) loadings demonstrated the largest noninvariance, and after freeing this parameter, the partial metric invariance across 31 countries was supported. Finally, the scalar model showed a substantial deterioration in model fit compared to the partial metric model ($\Delta CFI=-0.050$, $\Delta RMSEA=0.017$). Given the large drop in model fit and a number of noninvariant parameters, we decided not to test the partial scalar model but instead to evaluate the approximate invariance using the alignment method.

Alignment Method Results

The alignment method (Table 4) revealed that 9.5% of parameters (71 out of 744; 51 intercepts and 20 loadings) showed evidence of noninvariance. Among item loadings, two PA items (“good” in 8 countries and “contented” in 4 countries) and two

Table 2 Correlations between positive affect and negative affect factors across countries

Country	MLR	WLSMV
Austria	-0.48***	-0.50***
Bangladesh	0.20**	0.20***
Bosnia and Herzegovina	-0.65***	-0.64***
Canada	-0.68***	-0.69***
Chile	-0.43***	-0.46***
Colombia	-0.54***	-0.55***
Croatia	-0.75***	-0.76***
Cuba	-0.56***	-0.58***
Estonia	-0.64***	-0.69***
France	-0.63***	-0.66***
Germany	-0.44***	-0.44***
Hungary	-0.67***	-0.68***
India	-0.17*	-0.21***
Indonesia	-0.49***	-0.50***
Iran	-0.59***	-0.61***
Italy	-0.49***	-0.48***
Japan	0.02	0.05
Lithuania	-0.40***	-0.43***
Mexico	-0.52***	-0.53***
Montenegro	-0.66***	-0.66***
Netherlands	-0.59***	-0.61***
North Macedonia	-0.51***	-0.54***
Peru	-0.44***	-0.46***
Poland	-0.55***	-0.55***
Portugal	-0.36***	-0.38***
Romania	-0.74***	-0.76***
Serbia	-0.68***	-0.69***
Slovenia	-0.71***	-0.71***
South Africa	-0.16**	-0.19***
Spain	-0.50***	-0.50***
Turkey	-0.66***	-0.66***
Pooled sample	-0.49***	-0.50***

Note. Correlations for Indonesian and Lithuanian data are from the modified two-factor model. MLR=Robust Maximum Likelihood; WLSMV=Weighted Least Squares Means and Variance Adjusted
 *** $p < .001$, ** $p < .01$, * $p < .05$

NA items (“afraid” and “angry” in 2 countries each) showed greatest noninvariance across countries (see Table 4). Item intercepts of six items (“positive,” “joyful,” “contented,” “sad,” “afraid,” and “angry”) were noninvariant in at least five countries.

Factor loadings of five items (“happy,” “joyful,” “negative,” “bad,” and “sad”), as well as intercepts of three items (“happy,” “negative,” and “bad”) were invariant across all countries.

There were six countries with more than three noninvariant parameters (Serbia, Hungary, the Netherlands, Lithuania, Iran, and Spain), whereas the remaining countries had up to three noninvariant parameters (see Table S6).

Table 3 Cross-national measurement invariance

Model	χ^2	df	CFI	RMSEA [90% CI]	Δ CFI	Δ RMSEA
MLR estimator						
Configural	3983.60	1639	0.960	0.052 [0.050, 0.054]	–	–
Metric	4999.00	1939	0.948	0.055 [0.053, 0.057]	–0.012	0.003
Partial Metric (λ_3 free)	4833.87	1909	0.951	0.054 [0.052, 0.056]	–0.009	0.002
Scalar	8132.51	2239	0.901	0.071 [0.069, 0.072]	–0.050	0.017
WLSMV estimator						
Configural	6950.35	1590	0.976	0.079 [0.077, 0.081]	–	–
Scalar	13546.23	2866	0.952	0.083 [0.082, 0.085]	–0.024	0.004

Note. MLR=Robust Maximum Likelihood; WLSMV=Weighted Least Squares Means and Variance Adjusted; CFI=Comparative Fit Index; RMSEA=Root Mean Square Error of Approximation; CI=Confidence Interval; Δ =change; λ =loading. The Netherlands was omitted from the analysis using the WLSMV estimator because there were zero responses of “5” on item 6 (unpleasant)

Aligned Cross-Country Mean Differences in PA and NA

Cross-country differences in the aligned factor means of PA are presented in Table S7 and Fig. 1, while those for NA are presented in Table S8 and Fig. 2. Adolescents in Montenegro, Serbia, Indonesia, Romania, and South Africa reported the highest levels of PA, whereas the lowest PA was found in Asian countries (except Indonesia) and several developed countries, including Italy, Canada, and the Netherlands. The highest NA was reported by adolescents in several high-income countries (Germany, France, Canada, Poland, and Austria), followed by three Asian countries (Turkey, Japan, and Indonesia). The lowest levels of NA were observed in the Netherlands, several Southern European countries (Bosnia and Herzegovina, Croatia, Montenegro, North Macedonia, Serbia, and Portugal), two Baltic countries (Estonia, Lithuania), Bangladesh, and Romania.

Gender Invariance Testing

Measurement invariance across gender was evaluated in each country separately (see Table S9). We omitted Austria from the analyses, as the sample included only 49 boys, and we focus on the results obtained using the MLR for the sake of simplicity. Full and partial scalar invariance across gender were supported in 18 and 11 countries, respectively. In Macau, the model fit was poor in both genders, whereas in Turkey, the fit was poor among boys. Therefore, the latent mean differences between boys and girls were evaluated in 29 countries.

Latent Mean Differences across Gender

The results revealed no substantial gender differences ($p>.01$) in PA in the vast majority of countries (26 out of 29; see Table 5). In Colombia, Hungary, and Iran, boys reported significantly higher ($p<.001$) levels of PA than girls. In contrast, girls reported significantly higher ($p<.01$) levels of NA than boys in 22 out of 29 countries. No significant gender differences ($p>.01$) in NA were found in Bangladesh, Chile,

Table 4 Results of alignment method

	Est	R ²	N noninv	Noninvariant groups
Intercepts				
Item 1 (positive)	3.48	0.90	8	AUT, CAN, DEU, HRV, PER, POL, SRB, SVN
Item 2 (negative)	1.96	0.81	0	
Item 3 (good)	3.60	0.91	2	IDN, LTU
Item 4 (bad)	1.72	0.86	0	
Item 5 (pleasant)	3.56	0.91	3	LTU, NLD, ZAF
Item 6 (unpleasant)	1.74	0.89	1	PER
Item 7 (happy)	3.59	0.96	0	
Item 8 (sad)	1.91	0.75	5	CHL, CUB, FRA, MEX, POL
Item 9 (afraid)	1.91	0.47	9	BIH, FRA, HUN, JPN, MKD, MNE, NLD, SRB, SVN
Item 10 (joyful)	3.56	0.78	7	CAN, DEU, HUN, LTU, NLD, SRB, SVN
Item 11 (angry)	2.20	0.18	8	BIH, CUB, EST, IRN, MNE, MKD, NLD, SRB
Item 12 (contented)	3.35	0.68	8	BGD, CHL, ESP, HUN, IDN, MEX, PER, POL
Loadings PA				
Item 1 (positive)	0.92	0.87	1	ESP
Item 3 (good)	0.77	0.65	8	BGD, DEU, ESP, HRV, HUN, IRN, JPN, PRT
Item 5 (pleasant)	0.85	0.70	2	BGD, ROU
Item 7 (happy)	1.02	0.89	0	
Item 10 (joyful)	0.96	0.72	0	
Item 12 (contented)	0.92	0.48	4	CAN, ESP, HUN, IRN
Loadings NA				
Item 2 (negative)	0.78	0.81	0	
Item 4 (bad)	0.79	0.75	0	
Item 6 (unpleasant)	0.73	0.77	1	SRB
Item 8 (sad)	0.79	0.84	0	
Item 9 (afraid)	0.57	0.32	2	IRN, SRB
Item 11 (angry)	0.52	0.44	2	LTU, ZAF

Note. Est=aligned parameter; R²=measure of parameter's invariance; N noninv=number of countries in which parameter was noninvariant; PA=Positive Affect; NA=Negative Affect; AUT=Austria; BGD=Bangladesh; BIH=Bosnia and Herzegovina; CAN=Canada; CHL=Chile; CUB=Cuba; DEU=Germany; ESP=Spain; EST=Estonia; FRA=France; HRV=Croatia; HUN=Hungary; IDN=Indonesia; IRN=Iran; JPN=Japan; LTU=Lithuania; MEX=Mexico; MKD=North Macedonia; MNE=Montenegro; NLD=Netherlands; PER=Peru; POL=Poland; PRT=Portugal; ROU=Romania; SRB=Serbia; SVN=Slovenia; ZAF=South Africa

Croatia, India, Japan, and Lithuania, whereas boys reported higher levels of NA than girls only in South Africa.

Discussion

The present study aimed to extend our understanding of emotional experience and its assessment in a cross-cultural context by evaluating the cross-national and gender invariance of the SPANE in a sample of adolescents recruited across 32 countries. Although not our primary focus, we also tested mean differences in PA and NA across countries and gender. Several findings stand out.

Table 5 Latent mean differences across gender

Country	Positive Affect			Negative Affect		
	Estimate	SE	<i>p</i>	Estimate	SE	<i>p</i>
Bangladesh	-.212	.086	.013	.081	.067	.230
Bosnia and Herzegovina	.141	.073	.054	-.329	.077	<.001
Canada	.142	.087	.102	-.504	.095	<.001
Chile	-.063	.092	.491	-.282	.111	.011
Colombia	.447	.113	<.001	-1.031	.135	<.001
Croatia	-.002	.097	.980	-.025	.120	.832
Cuba	.081	.065	.210	-.288	.076	<.001
Estonia	.078	.091	.393	-.487	.101	<.001
France	.201	.103	.051	-.676	.122	<.001
Germany	-.092	.086	.287	-.222	.083	<.01
Hungary	.245	.067	<.001	-.705	.076	<.001
India	.047	.085	.583	-.036	.077	.639
Indonesia	.132	.103	.203	-1.197	.201	<.001
Iran	.346	.091	<.001	-.325	.097	<.01
Italy	.142	.092	.123	-.267	.098	<.01
Japan	-.188	.082	.022	-.212	.083	.011
Lithuania	-.042	.094	.654	.032	.124	.798
Mexico	.239	.096	.013	-.539	.109	<.001
Montenegro	.094	.077	.226	-.500	.079	<.001
Netherlands	.314	.140	.025	-.728	.234	<.01
North Macedonia	.013	.078	.871	-.306	.090	<.01
Peru	.118	.093	.206	-.654	.117	<.001
Poland	.056	.097	.563	-.560	.109	<.001
Portugal	.121	.089	.173	-.334	.114	<.01
Romania	.106	.099	.286	-.393	.108	<.001
Serbia	.078	.048	.102	-.524	.055	<.001
Slovenia	.027	.069	.702	-.544	.078	<.001
South Africa	.099	.100	.325	.360	.111	<.01
Spain	-.020	.093	.827	-.382	.103	<.001

Note. Three countries were omitted from the analyses: Austria (not tested because there were only 49 boys in the sample), Macau (poor fit in both gender groups), and Turkey (poor fit among boys). Women served as a reference group (with latent means fixed to zero)

First, our results show that the original two-factor structure of the SPANE is supported in most countries (29 out of 32), corroborating previous findings obtained from samples across different world regions (e.g., Jovanović et al., 2020; Rahm et al., 2017; Rice & Shorey-Fennell, 2020; Yaaqeb et al., 2022). The original two-factor solution fitted poorly to the data in only three countries (Indonesia, Lithuania, and Macau), whereas the internal consistency of the SPANE subscales was low in Turkey, especially among boys. However, the fit of the modified two-factor solution improved after adding two pairs of theoretically meaningful correlated error terms in Indonesia (“sad–afraid” and “happy–joyful”) and Lithuania (“good–pleasant” and “bad–unpleasant”), but not in Macau. A poor fit of the two-factor model (both original and modified) to the data obtained from Macanese adolescents is puzzling, as the Chinese version of the SPANE we used in the present study did not show such prob-

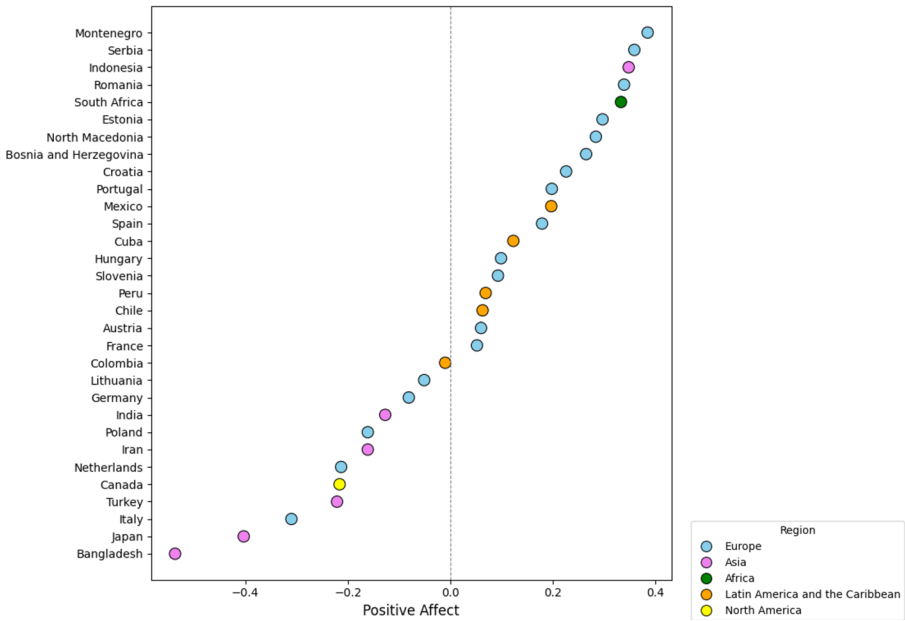


Fig. 1 Aligned positive affect means across countries

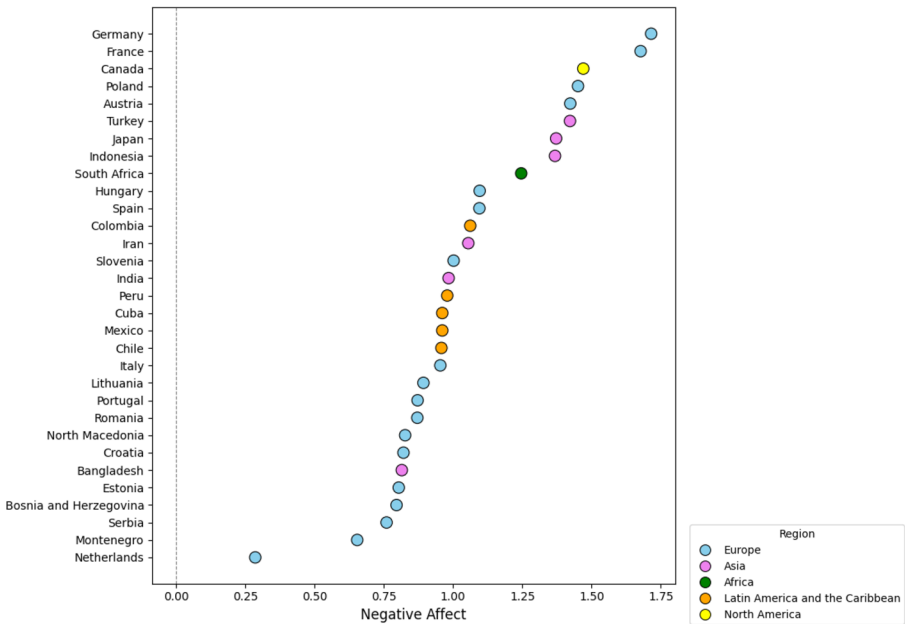


Fig. 2 Aligned negative affect means across countries

lems with a community sample in Macau (Tong & Wang, 2017). A potential explanation for this finding is that thinking about emotional experiences and reporting them to a researcher–stranger might not be a usual, everyday experience for Macanese adolescents. Furthermore, the use of several pairs of bipolar opposites within the SPANE might be challenging for individuals having a tendency toward dialectical thinking and accepting the unity of opposites (Peng & Nisbett, 2000). These findings warrant replication to investigate potential factors contributing to the poor fit in Macau found in the present study.

Second, the correlations between PA and NA were found to vary greatly across countries, ranging from weakly positive in Bangladesh, close to zero in Japan, weakly negative in India and South Africa, to moderate and strongly negative in the remaining countries. This observation is in line with the results of previous cross-cultural studies using the SPANE (Jovanović, Joshanloo, et al., 2022; Jovanović, Rudnev, et al., 2022) and other measures of emotional experiences (e.g., Bagozzi et al., 1999; Schimmack et al., 2002), showing that the PA–NA association is typically weaker in Asian than in Western countries. Our findings support the idea that individuals in Western and European countries construe positive and negative emotions as bipolar opposites, whereas a dialectical understanding of emotions—a belief that emotions are constantly changing and that positive and negative emotions can coexist—is prevalent in many Asian countries (Wilken & Miyamoto, 2018). As argued by Miyamoto et al. (2017), Western cultures are characterized by pro-positive (positive orientation toward pleasant emotions) and contra-negative (negative orientation toward unpleasant emotions) emotion systems, whereas a balanced system of emotion (both positive and negative orientation toward differently valenced emotions) is more likely in East Asian cultures. Although mechanisms driving these cultural differences in emotion systems—including differences in the relationship between PA and NA—are yet to be understood, interdependence and dialectical thinking are assumed to be key contributing factors (Miyamoto et al., 2017).

In contrast to the majority of cross-cultural studies focusing on East Asian and Western countries (most often the US), our sample also included five countries from Latin America and the Caribbean. The correlations between latent PA and NA factors in these five countries were around -0.50 , indicating that the pattern of associations between PA and NA in Latin American and Caribbean countries is more similar to those observed in European than Asian countries. This finding is consistent with the ISCWeB results on early adolescent samples (Casas & González-Carrasco, 2021), as well as with findings on greater similarity of the relationship between momentary positive and negative emotions in European Americans and Hispanic Americans than these two cultural groups and Asian Americans (Choi & Chentsova-Dutton, 2017).

Exact invariance testing supported the partial metric invariance of the SPANE across countries, with loadings of the item “good” showing the largest degree of non-invariance. Evidence of partial metric invariance indicates that cross-country comparisons of associations between PA/NA and other variables are justified and valid. However, scalar invariance was not supported, thus making cross-country comparison of the latent means obtained using the multi-group procedure questionable and probably invalid (e.g., Meuleman et al., 2023; but see Robitzsch & Lüdtke, 2023, for the opposite view). The failure to support scalar invariance in large cross-national

studies is not surprising, as studies involving many groups (e.g., more than 20 or 30) rarely achieve scalar invariance (Han et al., 2019). Fortunately, novel approaches to measurement invariance testing, such as the alignment method, can help overcome these limitations.

The alignment method applied to the present data showed that less than 10% of parameters were noninvariant, thus supporting approximate measurement invariance of the SPANE across countries and allowing meaningful cross-national comparison of aligned means. Several items showed the greatest evidence of noninvariance across countries, especially “afraid,” “angry,” “good,” and “contented.” The former two NA items were also most noninvariant in a 13-country study of the SPANE in adult samples (Jovanović, Joshanloo, et al., 2022), whereas “afraid” was noninvariant in a study on adolescents from India, Poland, and Serbia (Jovanović, Rudnev, et al., 2022). These findings add to the growing body of research from comparative linguistics showing that specific emotion terms have different meanings across cultures (e.g., Jackson et al., 2022), although the words referring to several emotions traditionally considered to be basic are found even in the analyses of mutually isolated languages (Saucier et al., 2014). Notably, parameters of three items (“happy,” “negative,” and “bad”) were found to be invariant across all countries, suggesting that these terms might be especially useful for cross-cultural research on emotional experiences in adolescents. The high level of invariance of the item “happy” is somewhat surprising since the concept of happiness has been shown to vary across cultures and languages (e.g., Oishi et al., 2013). Therefore, future cross-cultural studies should aim to replicate this finding and investigate whether conceptions of happiness differ among adolescents and adults. A high degree of invariance of the items “negative” and “bad” is in line with previous studies indicating cross-language ubiquity of general evaluative terms (e.g., Saucier et al., 2014).

The SPANE items were found to operate similarly among boys and girls in almost all countries, providing evidence for either partial or full scalar invariance across gender. These results indicate that latent mean comparisons of PA and NA across gender are valid, aligning with the majority of previous studies using the SPANE among adolescents (e.g., de Jesús Cardona-Isaza et al., 2025) and adults (e.g., Kyriazos et al., 2018; Li et al., 2013). Our results showed that girls reported higher NA than boys in most countries, whereas gender differences in PA were negligible, with few exceptions (boys reported higher PA than girls only in Colombia, Hungary, and Iran). Recent large-scale studies on gender differences in affective well-being have yielded conflicting results for adolescents and adults. For example, Blanchflower and Bryson (2024b) used a range of PA and NA indicators from various cross-national studies and concluded that: “Almost always and everywhere, women express higher negative affect and lower positive affect than men” (p. 684). However, their findings on adolescent data from the PISA showed that girls reported higher levels of both PA (items “joyful,” “cheerful,” and “happy”) and NA (“sad,” “miserable,” “scared,” and “afraid”), with stronger effects for NA. Using the PISA 2018 dataset from 73 countries, Campbell et al. (2021) found that on average, girls reported lower levels of well-being than boys on all four indicators: life satisfaction, NA (termed “psychological distress” by the authors), PA (termed “hedonia” by the authors), and meaning in life (termed “eudaemonia” by the authors), with the

largest differences for NA and the smallest for PA. Some important cross-country and regional differences in gender differences in PA and NA can also be observed in the PISA 2018 dataset. For example, NA was higher among girls in each country, but the differences were largest in European, economically developed countries (e.g., Sweden, the Netherlands, Finland, Germany, Denmark, and Austria). In contrast, the cross-country variation in gender differences on PA was more substantial compared to NA; girls reported higher PA in some countries (Uruguay, Slovenia, Hungary, Costa Rica, and Chile), while boys reported higher PA in other countries (Saudi Arabia, Jordan, Japan, and Qatar), and—in most countries—the differences were small or negligible (e.g., Indonesia, Peru, Montenegro, and Austria). The global pattern of results in our study is similar to those reported by Campbell et al. (2021), but findings regarding regional differences are difficult to compare as our sample included a smaller number of countries and did not cover Scandinavian and many of the Middle East countries where notable gender differences were found in the PISA dataset.

Cross-national comparisons of aligned PA and NA means produced complex findings. Among the top ten countries with the highest levels of PA were several European countries (mostly from Southern Europe) and one country each from Asia (Indonesia) and Africa (South Africa). The lowest levels of PA were reported by adolescents from Asian countries (Bangladesh, Japan, Turkey, Iran, and India) and economically developed Western countries (e.g., Italy, Canada, the Netherlands, and Germany). Levels of NA across countries generally followed a similar but opposite pattern. For example, adolescents reported the highest NA levels in Asian and developed countries, while adolescents from former Yugoslav republics (excluding Slovenia) reported one of the lowest levels of NA. However, some notable exceptions should be noted. In a few countries, adolescents reported lower levels of both PA and NA (e.g., Bangladesh and the Netherlands) or higher levels of both PA and NA (e.g., Indonesia and South Africa) compared to other countries. Studies on cross-national differences in adolescent PA and NA are still sparse, and findings using different datasets are conflicting. For example, using the PISA 2018 data from 72 middle- and high-income countries, Rudolf and Bethmann (2023) found evidence of lower levels of subjective well-being among adolescents in wealthier countries, leading the authors to call this effect “the paradox of wealthy nations’ low adolescent life satisfaction” (Rudolf & Bethmann, 2023). Although the effect was strongest for life satisfaction (i.e., a negative log-linear relationship between per-capita GDP and adolescent life satisfaction), it was also evident for PA (a negative relationship) and NA (a positive relationship), albeit the effects were weaker. Similar findings on the negative relationship between economic development and subjective well-being in middle adolescence were reported by other authors using the PISA data (e.g., Campbell et al., 2021). However, a study using GWP data collected in 2015–2019 on 15–17-year-olds from 139 (including low-income) countries came to a different conclusion: Marquez et al. (2024) found positive associations between economic development and adolescent life satisfaction and PA, and a negative association between economic development and NA, attributing previous conflicting findings to the omission of low-income countries in the sample. More research on adolescent samples is certainly needed to

draw sound conclusions on whether the relationship between economic development and subjective well-being is age-specific.

Limitations and Future Directions

Although this is the first large multi-country study to investigate cross-national and gender invariance of the SPANE among adolescents recruited across five continents, it is not without limitations. First, our sample was restricted to middle and late adolescents aged 14–19 years. Future studies should also include early adolescents to evaluate whether the SPANE is invariant across stages of adolescence. This question is an important avenue for future research because younger and older adolescents might have different levels of understanding and attribute different meanings to specific positive and negative emotions due to age differences in emotion vocabulary (e.g., refinement of emotion concepts) and language complexity (e.g., Bazhydai et al., 2019). Second, despite covering diverse samples from 32 countries, some world regions remained underrepresented in our study (i.e., Africa, Central Asia, Northern Europe, and Oceania), and the majority were European countries. Future studies should strive toward more comprehensive geographical coverage to enable more nuanced analyses, including country-level variables that might help understand cross-national and gender differences in adolescent PA and NA, such as gender inequality (Campbell et al., 2021) and economic development (Marquez et al., 2024). Third, for practical reasons, we focused on structural validity, measurement invariance testing, and mean differences in PA and NA across countries and gender. Further examination of other aspects of SPANE's validity—such as predictive and incremental validity, rarely examined in cross-cultural research—is warranted. Finally, future studies should carefully investigate bias in response styles (e.g., acquiescent responding and extreme responding) as a potential factor contributing to cross-national differences in mean levels of PA and NA (e.g., Yang et al., 2010).

Conclusions

The SPANE demonstrated favorable performance as a measure of positive and negative emotional experiences in diverse cultural contexts. Given the increasing implementation of affective well-being measures in large cross-national studies among adolescents, using the same, psychometrically sound measure of PA and NA in different studies seems essential for enabling greater comparability of study findings. The SPANE holds promise of being one such measure, but it should be thoroughly cross-culturally evaluated in tandem with other widely used measures of PA and NA.

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Preparation, Writing – Review & Editing; Vesna Gavrilov-Jerković, Milica Lazić, Vojana Obradović, Dušana Šakan, Aleksandar Tomašević, and Marija Zotović-Kostić, contributed to Funding Acquisition, Investigation, and Writing – Review & Editing; Sabirah Adams, Rebeca Aritio Solana, Christ Billy Aryanto, Andreja Avsec, Ali Bakhshi, Michael Bender, Sophie Berjot, Sonia Betancourth Zambrano, Andreja Brajša-Žganec, Yunier Broche-Pérez, Carmen Buzea, Rosario Cabello, Rosalinda Cassibba, Judith Cavazos-Arroyo, Fatemeh Daemi, Diego D. Díaz-Guerra, Marija Džida, Mona Eidelsburger, Pablo Fernández-Berrocal, Evelyn Fernández-Castillo, Eduardo Fonseca-Pedrero, Tomasz Frackowiak, Teresa Freire, Biljana GJoneska, Jesús Guerrero-Alcedo, Md Jamil Hossain, Jessie Hillekens, Stefan Höfer, Tareq Mahmud, Naved Iqbal, Szilvia Jámbori, Mohsen Joshanloo, Ljiljana Kaliterna Lipovčan, Tina Kavčič, Marta Kowal, Marija Krstevska Taseva, Kwok Kit Tong, Denisse Manrique-Millones, Alessia Mariano, Michal Misiak, Pasquale Musso, Javier Ortuño Sierra, Ioana Orzea, Ahmet Özaskan, Joonha Park, Marija Pašić, Rasa Pilkauskaitė Valickienė, Rogelio Puente-Díaz, Lizbeth Puerta-Sierra, Gordana Ristevska Dimitrovska, S. Craig Roberts, Puji Tania Ronauli, Shazly Savahl, Danielius Serapinas, Sok Ian Kuan, Agnieszka Sorokowska, Piotr Sorokowski, Dijana Sulejmanović, Mst Sadia Sultana, Sze Man Yuen, Erzsébet Szél, Henri Tilga, Wenceslao Unanue, Jesús Unanue, Marieke van Egmond, Murat Yıldırım, Gaja Zager Kocjan, and Laura Zamarian contributed to Investigation and Writing – Review & Editing. All authors have agreed to the final submitted version.

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Data Availability All materials, including datasets and analysis syntaxes can be found at: <https://osf.io/wg7ae/>.

Declarations

Ethics Approval The study was approved by the Ethics Committee of the Faculty of Philosophy, University of Novi Sad (Approval Code: 02-313/4–1: Approval Date: May 16, 2022), and by the institutional ethics committee or review board in each country involved in the present study.

Patient Consent Statement The parent/guardian consent was obtained in countries where parental consent was required for a certain age. In other countries, informed consent was obtained and the sample included only adolescents who are free to consent to research participation according to domestic legislation (for example, in the Netherlands and Serbia, adolescents are free to consent to research participation with 16 and 15 years, respectively).

Competing interests The authors report there are no competing interests to declare.

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