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Measurement invariance of the Straightforwardly-Worded Social Interaction Anxiety Scale and Associations with life satisfaction among emerging adults attending University in 10 countries

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ABSTRACT

The aim of the present study was to assess the measurement invariance of the long version of the straightforwardly-worded *Social Interaction Anxiety Scale* (S-SIAS) across 10 countries and explore links with life satisfaction in a large sample of emerging adults attending university. Participants were $N = 4284$ university students ($M_{age} = 19.89$ years, $SD = 1.83$; 65 % females) from 10 countries (i.e., Argentina, Australia, Canada, China, India, Italy, South Korea, Norway, Turkey, and the United States), who completed self-report assessments of social anxiety and life satisfaction. Findings from a multiple-group factor analysis alignment method indicated approximate measurement invariance for the S-SIAS across the 10 country sites. University students from Norway reported the highest mean level of social anxiety of all groups, whereas participants from Argentina reported the lowest social anxiety. Results from multigroup regression analysis indicated that social anxiety was negatively associated with life satisfaction in all samples (except for Argentina and Australia, where the life satisfaction measure was not collected), but the strength of the association was stronger in Norway compared to samples from other countries. Results are discussed in terms of the meaning and implication of social anxiety across cultures.

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1. Introduction

Social anxiety refers to a marked fear or anxiety about one or more social situations in which the individual is exposed to possible scrutiny by others, including social interactions, being observed, and episodes of performance (American Psychiatric Association, 2022). Lifetime prevalence rates of social anxiety disorder (SAD) range from 4 % to 13 % across culture (e.g., Alonso et al., 2004; Kessler et al., 2005; Merikangas et al., 2010; Ruscio et al., 2008; Stein et al., 2017), with recent findings suggesting a steep rise among young people (Jefferies & Ungar, 2020; Salari et al., 2024). Among adolescents and young adults, SAD diagnoses and elevated (but sub-clinical) symptoms of social anxiety are robustly associated with social and emotional impairments (Aderka, Nickerson, Bøe, & Hofmann, 2012; de Lijster et al., 2018; Dickson et al., 2024; Fehm, Beesdo, Jacobi, & Fiedler, 2008), as well as poorer quality of life and life satisfaction (Olatunji, Cisler, & Tolin, 2007). The academic context appears to be particularly stressful for socially anxious students (Vilaplana-Pérez et al., 2021) including emerging adults attending university (Archbell & Coplan, 2022).

A handful of previous studies have compared the prevalence and concomitants of social anxiety across cultures (e.g., Hofmann, Anu Asnaani, & Hinton, 2010; Jefferies & Ungar, 2020; Schreier et al., 2010). However, contemporary methodologists argue that such comparisons are not appropriate without first establishing measurement invariance across cultures (Leitgöb et al., 2023). Accordingly, the primary aim of the current study was to establish measurement invariance of the *Social Interaction Anxiety Scale* (SIAS, Mattick & Clarke, 1998), a commonly used measure of social anxiety, in samples of emerging adults attending university across 10 countries. Assuming measurement invariance could be established, a secondary goal was to compare mean symptom levels of social anxiety and associations with life satisfaction across countries.

1.1. Overview of social anxiety across cultures

Given cultural differences in social norms, expectations, and societal values, many researchers have explored potential cultural differences in the prevalence and implications of social anxiety across cultures (Okawa et al., 2021; Rapee et al., 2011; Stein et al., 2017). Several theoretical (and even contrasting) rationales have been forwarded as to why we might expect cultural variations in the prevalence and implications of social anxiety. For example, it has been asserted that SAD is more prominent in Western cultures, such as the United States, Canada, and France, because of heightened socio-evaluative concerns among individuals (e.g., fear of embarrassing oneself) as compared to non-Western cultures, such as China, India, and Japan, where concerns are more likely to focus on not offending others (Dowbiggin, 2009; Kleinknecht, Dinnel, Kleinknecht, Hiruma, & Harada, 1997). Similarly, it has been asserted that there might be a markedly higher prevalence of SAD in higher income Western countries because of higher demands for individual assertiveness and social performance (Stein et al., 2017).

Yet, it has also been argued that social anxiety may be more prominent in East Asian cultures because interdependent values, which tend to emphasize the importance of close relationships, may increase feelings of self-consciousness. In turn, such socio-evaluative concerns may be further exacerbated by culturally promoted behaviors that prioritize group harmony, such as staying quiet and being socially submissive (Jefferies & Ungar, 2020; Schreier et al., 2010; Zhong et al., 2023). It has been further suggested that culturally-valued social scripts in Latin American countries (e.g., being polite and respectful, de-emphasizing negative social behaviors, refraining from criticizing others) may create a social environment that serves to reduce the prevalence of social anxiety in such countries (Holloway, Waldrip, & Ickes, 2009; Schreier et al., 2010). In contrast, in Scandinavian countries, the cultural emphasis on privacy may reduce opportunities for supportive social interactions and thereby exacerbate feelings of social anxiety when social interaction occurs (Braathu, Karevold, Bowker, & Coplan, 2022).

Results from empirical studies comparing social anxiety across cultures have also been somewhat mixed. Most of these studies have compared samples from two different countries (Fergus, Valentiner, Kim, & Mcgrath, 2014; Wong et al., 2019; Zhong et al., 2023). For example, Zhong et al. (2023) reported higher levels of social anxiety in mainland China as compared to the USA, as evaluated by the SIAS. A handful of studies have taken a more comprehensive approach. For example, Schreier et al. (2010) compared mean levels of social anxiety symptoms (as assessed by the SIAS) in nine countries (Australia, Canada, Costa Rica, Ecuador, Germany, Japan, South Korea, The Netherlands, United States). Overall, participants reported the lowest levels of social anxiety in Latin American countries (i.e., Costa Rica, Ecuador) and highest in East Asian countries (i.e., Japan, South Korea).

Jefferies and Ungar (2020) compared social anxiety symptoms as assessed by the SIAS across seven countries (Brazil, China, Indonesia, Russia, Thailand, United States, Vietnam). Self-reported social anxiety levels were found to be highest in the US and Brazil, and lowest in Vietnam and Russia. As part of a larger study of perfectionism, impulsivity, and self-esteem, Pietrabissa et al. (2020) reported mean differences in social anxiety (as assessed by a brief version of the SIAS) across eight countries (Australia, Belgium, Canada, China, Italy, Japan, Spain, United States). They found the highest self-reported social anxiety symptoms among participants from Japan, followed by Australia and China, and the lowest social anxiety among participants from Belgium and Italy.

Finally, in the most extensive cross-cultural study of the prevalence of SAD diagnoses, Stein et al. (2017) assessed SAD using the WHO Composite International Diagnostic Interview (CIDI 3.0; Kessler, & Ustün, 2004) in 28 countries. Among their results, prevalence rates for SAD diagnoses were found to be lowest in low/lower-middle income countries and in the African and Eastern Mediterranean regions, whereas the highest rates for SAD diagnoses were found in higher income countries and in the Americas and Western Pacific regions. In sum, available evidence suggests that there may be mean level country differences in social anxiety symptoms, although it is not clear in which societies the symptoms may be most elevated.

1.2. Assessing social anxiety with the SIAS across cultures

The SIAS is one of the most widely used self-report assessments of social anxiety (Wong, Gregory, & McLellan, 2016). There is substantial support for the reliability and validity of the English version of the SIAS as a measure of social anxiety in clinical and community samples, including high internal consistency (α =.85–.94) and good test-retest reliability at intervals of up to 13 weeks (r=.91–.93; Heidenreich, Schermelleh-Engel, Schramm, Hofmann, & Stangier, 2011; Mattick & Clarke, 1998). Translated versions of the SIAS have similarly demonstrated good to excellent internal consistency across several languages (Jefferies & Ungar, 2020; Schreier et al., 2010), including Spanish (Olivares, García-López, & Hidalgo, 2001), Dutch (de Beurs, Tielen, & Wollmann, 2014), Swedish (Mörtberg, Reuterskiöld, Tillfors, Furmark, & Öst, 2017), and Mandarin Chinese (Zhong et al., 2023). In addition to the original (long-form) version of the SIAS, short-forms have been widely used. Although there is some evidence to suggest that the long-form version of the SIAS outperforms short-form versions in terms of assessing treatment efficacy (Erceg-Hurn and McEvoy, 2018), results from other comparisons suggest comparable performance (Carleton et al., 2014; Sunderland et al., 2020).

Of note, the original SIAS includes three reverse-scored items (i.e., “I find it easy to make friends my own age”; “I am at ease meeting people at parties, etc.”; “I find it easy to think of things to talk about”), which have been the subject of considerable debate (e.g., Rodebaugh, Woods, & Heimberg, 2007). In particular, examination of the factor structure of both English and non-English versions of the SIAS suggest that the reverse-scored items load onto a separate factor from the remaining items, and that the exclusion of the reverse-scored items improves the

psychometric properties (Eidecker, Glöckner-Rist, & Gerlach, 2010; Jefferies & Ungar, 2020; Rodebaugh et al., 2011). It has also been argued that the three reversed items are actually primarily assessing extraversion rather than social interaction anxiety (Eidecker et al., 2010; Rodebaugh et al., 2007). Accordingly, it has been argued that it is optimal to omit these reversed-scored items, resulting in what has been referred to as the *straightforwardly-worded* version of the SIAS (S-SIAS; Rodebaugh et al., 2011; Wong et al., 2019).

Despite its widespread use in different countries, formal tests of the measurement invariance of the SIAS and S-SIAS across cultures remain scarce. The measurement invariance of the factor structure of the instruments indicates that they are 'working similarly' across groups, thus allowing for direct mean level comparisons (Marsh et al., 2018). A few studies established measurement invariance of the short-form of the SIAS in pairs of countries, including South Korea and the USA (Fergus et al., 2014), as well as China and the USA (Zhong et al., 2023). In their study of samples of emerging adults from eight countries (i.e., Australia, Belgium, Canada, China, Italy, Japan, Spain, and the United States), Pietrabissa et al. (2020) reported only partial support for the invariance of the 6-item version of the SIAS. Results from a multigroup confirmatory factor analysis (MG-CFA) testing configural, metric, and scalar/-strong invariances revealed only partial scalar invariance (i.e., item intercept invariance) of the SIAS-6, suggesting possible linguistic/cultural influences.

In terms of the long-form versions, Wong et al. (2019) found partial scalar invariance for the S-SIAS only for a subset of items across samples from Australia and Japan. Other studies using the long-form SIAS (e.g., Schreier et al. 2010) or S-SIAS (e.g., Jefferies & Ungar, 2020; Jefferies, Höltge, & Ungar, 2021) across multiple countries did not report formal tests of measurement invariance. As such, to our knowledge, measurement invariance of the long-form S-SIAS has yet to be assessed across multiple countries. The establishment of measurement invariance is a prerequisite that allows researchers to then make assertions about possible differences in mean levels of social anxiety across different countries. In other words, it is only when measurement invariance is established that direct mean level comparisons of social anxiety across groups are valid (Marsh et al., 2018).

1.3. The current study

As aforementioned, there are varied theoretical arguments and empirical results pertaining to mean level differences in social anxiety across cultures. It is possible that some of the inconsistent empirical findings could be particularly attributed to measurement issues across countries. Accordingly, the primary goals of the present study were to establish measurement invariance of the straightforwardly-worded SIAS (Mattick & Clarke, 1998; Rodebaugh et al., 2011; Wong et al., 2019) and evaluate mean differences in social anxiety among samples of emerging adults attending university across 10 countries. We focused on university students during emerging adulthood (ages 19–29 years) due to the increase of social anxiety symptoms during this developmental period and the increased pressures for those attending university (e.g., group work in classrooms, dorm living and/or living away from home, building new social relationships; Fam, Murugan, & Yap, 2020; Zheng & Zheng, 2023). In the current study, we employed the multigroup factor analysis alignment method (Asparouhov & Muthén, 2014; Muthén & Asparouhov, 2014), which is particularly useful when there are multiple countries. Indeed, in the presence of several countries, establishing measurement invariance using more traditional methods, such as multigroup confirmatory factor analysis (MG-CFA), is often not easy to achieve (Marsh et al., 2018). Therefore, by using the multigroup factor analysis alignment method, we hypothesized that we could establish measurement invariance of the straightforwardly worded SIAS across 10 countries.

Drawing upon previously established robust negative associations between social anxiety and life quality (Dryman, Gardner, Weeks, & Heimberg, 2016; Eng, Coles, Heimberg, & Safren, 2005; Olatunji et al., 2007), an additional goal of this study was to explore associations between symptoms of social anxiety and life satisfaction across countries (but not in Argentina and Australia, where this measure was not administered to participants). Life satisfaction refers to the subjective evaluation of one's own life, according to individualized criteria (Diener, Emmons, Larsen, & Griffin, 1985). We hypothesized associations between social anxiety and life satisfaction across countries, which, in turn, would also serve to help establish the construct validity of the long-form of the S-SIAS. Further, on an exploratory basis, we also tested differences in the strength of the expected negative association between social anxiety and life satisfaction across samples. Given the mixed results from previous empirical studies comparing social anxiety across cultures, no specific hypotheses were formulated about the *strength* of the association between social anxiety and life satisfaction across countries. Finally, because previous studies reported that females generally report higher levels of social anxiety than males (Asher & Aderka, 2018), as well as possible gender-related cultural differences (Zentner, Lee, Dueck, & Masuda, 2023), we hypothesized higher mean levels of social anxiety in females compared to males, and controlled for sex in our analyses across countries.

2. Method

2.1. Participants

Participants were $N = 4284$ emerging adults (65.4 % female[1]) aged 18–29 years ($M_{age} = 19.89$, $SD = 1.83$) enrolled in undergraduate introductory psychology courses at universities in urban regions in 10 countries (Argentina, Australia, Canada, China, India, Italy, South

Table 1
Demographic Information, Data Collection Method, and Internal Consistency (Cronbach's Alpha) of the S-SIAS for the Full Sample and by Country.

Country	Sample Size	Males (%)	Females (%)	Mean Age in Years (*SD*)[c]	17-item S-SIAS α
Full Sample	4284	33.8	65.4	19.89 (1.83)[a]	.93
Canada	571	39.1	60.1	19.71 (2.14)	.95
USA	662	44.3	55.1	19.82 (1.63)	.95
Argentina	238	22.7	76.9	19.39 (2.13)	.88
Italy	340	10.3	89.7	21.36 (1.66)	.94
China	820	47.2	50.6	18.89 (0.88)	.91
Australia	284	18.3	81.7	19.45 (2.09)	.94
India	297	27.6	71.4	22.20 (1.35)	.86
Turkey	569	27.6	71.5	19.91 (1.49)	.94
South Korea	259	43.2	56.8	19.91 (0.91)	.93
Norway	244	21.3	78.7	-[b]	.94

Note. S-SIAS = Straightforwardly-worded version of the Social Interaction Anxiety Scale (Mattick & Clarke, 1998; Rodebaugh et al., 2011; Wong et al., 2019).
Sex percentages may not add up to 100 within samples as a function of missing data.
[a] Mean age does not include data from Norway since this information was not collected in this country.
[b] Exact age of participants was not collected in this sample.
[c] University students from India and Italy were significantly older than participants from other countries, university students from China were significantly younger than participant from other countries, and university students from Argentina and Australia were significantly younger than those from USA, South Korea, and Turkey, $F(8, 3957) = 155.497$, $p < .001$, $\eta^2 = .24$.

[1] Participants indicated their sex assigned at birth (0 = *male*, 1 = *female*).

Korea, Norway, Turkey, USA). Sample sizes and sociodemographic characteristics for each country are presented in Table 1.

Of note, participating university students from India and Italy were significantly older than participants from other countries, whereas students from China were significantly younger than participant from other countries (for detailed results, see Table 1). The total sample included participants from different ethnic groups, with approximately 31 % ($n = 1309$) self-reporting as Caucasian, 42 % ($n = 1792$) as Asian, 2 % ($n = 102$) as Black, 7 % ($n = 291$) as Hispanic/Latinx, 1 % ($n = 62$) as Arabic, and 4 % ($n = 154$) as "Other" (missing data was reported for 13 % of participants, $n = 574$). Ethnic group characteristics for each country are presented in Supplementary Materials (Table S1).

2.2. Procedures

All participants, recruited using a convenience sampling technique, completed a series of questionnaires, including some that were not of interest in this study, as part of a larger cross-cultural study on solitary experiences among university students (*blinded for peer review*). Participants completed questionnaires either using paper-and-pencil or online through Qualtrics, SurveyMonkey, Limesurvey, Nettskjema, or FluidSurveys. Questionnaires were administered using the most prevalent language in each University. For instance, participants received the English version of the questionnaires in most countries, including Norway, Canada, India, Australia (where the scale was developed), and the USA. The already validated Italian version was used in Italy (Sica et al., 2007). In Argentina (Spanish), Korea (Korean), China (Mandarin), and Turkey (Turkish), scholars employed the back-translation procedure for the SIAS and other questionnaires that were not previously validated. Many students received course credit for their study participation. In countries where English was not the primary language and a previously validated translated version was not available, measures were translated into their respective native language (by the collaborating research team in that country) and then back-translated into English, with discrepancies resolved by an expert panel. The study procedures were approved by each of the University Research Ethics Review Boards.

2.3. Measures

2.3.1. Social anxiety

Participants completed the straightforwardly-worded version of the *Social Interaction Anxiety Scale* (S-SIAS; Mattick & Clarke, 1998; Rodebaugh et al., 2011; Wong et al., 2019), designed to assess symptoms of social anxiety. The S-SIAS is comprised of 17 items (e.g., "I worry about expressing myself in case I appear awkward"; "I tense up if I meet an acquaintance in the street"). Respondents were asked to indicate the degree to which they felt each statement was characteristic or true for them on a 5-point Likert scale (from *not at all* to *extremely*). The factor structure and psychometric properties of the S-SIAS across countries are presented in the Results section.

2.3.2. Life satisfaction

Participants also completed the *Satisfaction with Life Scale* (SWLS, Diener et al., 1985). Of note, this measure was not administered in Argentina and Australia.The SWLS is comprised of 5 items designed to assess overall life satisfaction (e.g., "I am satisfied with my life") rated on a 7-point Likert scale (from 1 = *strongly disagree* to 7 = *strongly agree*). The single-factor structure of the SWLS and evidence of its validity has been established across a wide range of cultures (Emerson, Guhn, & Gadermann, 2017; Jovanović et al., 2022). Results from the multiple-group factor analysis alignment method suggested approximate measurement invariance of the SWLS across the 8 country groups (11 % of the estimated parameters were not invariant), with participants from India reporting the highest mean level of life satisfaction of all country groups. Conversely, students from Turkey reported the lowest mean level of life satisfaction of all groups. The Configural CFA model had an acceptable model fit, Yuan-Bentler $\chi^2_{Y\text{-}B}$ (40) = 273.723, $p < .001$, CFI = .960, TLI = .919, RMSEA = .112 [90 % CI:.100,.125], SRMR = .038. Overall, the scale revealed good reliability values in the total sample (α =.85) and in each country group (α =.89,.89,.85,.86,.72, .80,.87, 91 in Canada, United States, Italy, China, India, Turkey, Korea, and Norway, respectively).

2.4. Data analytic approach

To investigate the invariance of the S-SIAS across the 10 country groups, we ran a multigroup factor analysis alignment method (Asparouhov & Muthén, 2014; Muthén & Asparouhov, 2014). This method is appropriate when there are many groups, providing approximate factor loadings and intercepts invariance. Overall, approximate measurement invariance is obtained when less than 25 % of the estimated parameters are non-invariant, allowing to compare the estimated means of social anxiety across the 10 countries. Contrary to the traditional MG-CFA method, which requires stepwise strategy for testing the full and partial measurement invariance by constraining and freeing some parameters (i.e., meaning that only a subset of parameters is invariant, whereas other parameters differ across countries), the multigroup factor analysis alignment method estimates an approximate invariance and identifies non-invariant parameters, resulting in a more flexible approach to handle the partial equivalence across countries (Asparouhov & Muthén, 2014; Marsh et al., 2018).

Then, we performed a multivariate multigroup regression analysis to test the association between the social interaction anxiety factor and satisfaction with life, controlling for sex of university students. The fit of the *unconstrained* model (i.e., the path was freely estimated across the country groups) was compared to the fit of the *constrained* model (i.e., the path was constrained to be equal across the country groups) through the Satorra chi-square difference test for nested models ($\Delta\chi^2$) to test differences in the path across the country groups.

The models were evaluated based on several criteria for acceptable model fit indices including the Comparative Fit Index (CFI), the Tucker-Lewis-Index (TLI) (>.90), and the standardized root-mean-square residual (SRMR; <.08; Hu & Bentler, 1999). Since root-mean-square error of approximation (RMSEA) values tend to increase when several groups are involved, a more liberal cut-off of.10 was used to evaluate model fit (Rutkowski & Svetina, 2014). To optimize reliable estimates of our parameters, we ran all the analyses in *Mplus 8.4* (Muthén & Muthén, 1998-2017) with the maximum likelihood estimator with robust standard errors to non-normality (MLR[2]). Compared to the maximum likelihood estimator (ML), the MLR estimator provides robust standard errors and chi-square statistics, which are less sensitive to minor deviation of non-normality, thereby enhancing more reliable parameter estimates and model fit evaluation. Missing data were handled using the full-information maximum-likelihood estimation of the parameters.

3. Results

3.1. Measurement invariance

Missing data ranged from 0 % to 2 % for the S-SIAS items across countries. The configural CFA model had an acceptable fit,[3] Yuan-Bentler $\chi^2_{Y\text{-}B}$ (1190) = 3345.838, $p < .001$, CFI = .923, TLI = .912, RMSEA = .065 [90 % CI:.063,.068], SRMR = .045. Results from the multiple-group factor analysis alignment method, with Australia as the reference group since the scale was originally developed in this context, showed that at the intercept level, there were non-invariant intercepts in

[2] Analyses were also conducted with the WLSMV estimator and the results were the same as those reported in the main text using the MLR estimator.

[3] For the alignment method, the model fit is the one obtained from the configural model (Muthén & Asparouhov, 2018).

Canada (items 6, 15, and 20), USA (item 13), Argentina (items 12, 14, and 19), Italy (items 1, 10, 13, 17, and 19), China (items 1, 3, 4, 6, 10, 14, 15, 17, and 18), Australia (items 2 and 6), India (items 3, 6, 13, and 20), Turkey (items 3, 7, 17, 19, and 20), Korea (items 1, 13, 16, 17, 19, and 20), and Norway (items 4, 6, 12, 15, and 17). At the factor-loading level, findings suggested that there were non-invariant factor loadings in Argentina (item 19) and Italy (item 8). Overall, 13 % of the estimated parameters were not invariant, suggesting approximate measurement invariance of the S-SIAS across all the country groups. The internal reliability of the single factor was satisfactory across all countries (see Table 1).

Means for the one factor model as estimated by the alignment method are presented in Table 2. Findings suggested that participants from Norway reported the significantly highest mean level of social anxiety of all country groups, followed by Korea and then, Canada. Next, in line were India, China, and Australia, which did not differ significantly from each other, followed by Italy and then the USA and Turkey. Finally, participants from Argentina reported the lowest level of social anxiety of all country groups. Results from Analyses of Variance (ANOVAs) also revealed that there were no sex differences in mean social anxiety between females and males in the overall sample, $F(1, 4213) = 0.457$, $p = .499$, $\eta^2 = .001$.[4]

3.2. Multigroup regression analysis

Means and standard deviation for social anxiety and life satisfaction in each country group are reported in Table 3. The unconstrained model showed a good fit, $\chi^2_{Y\text{-}B}$ (7) = 9.042, $p = .249$, CFI = .995, TLI = .989, RMSEA = .025, 90 % CI [.001,.066], SRMR = .023, but it was statistically different, $\Delta\chi^2(7) = 20.885$, $p = .004$, from the constrained model, $\chi^2_{Y\text{-}B}$ (14) = 40.625, $p < .001$, CFI = .936, TLI = .927, RMSEA = .064, 90 % CI [.042,.088], SRMR = .069, suggesting cultural differences in the parameters estimated.[5] Based on the modification indexes and the chi-square contribution, we relaxed one parameter in Norway. The partially constrained model, $\chi^2_{Y\text{-}B}$ (13) = 26.677, $p = .014$, CFI = .967, TLI = .960, RMSEA = .048, 90 % CI [.021,.074], SRMR = .057, did not differ from the unconstrained model, as indicated by the non-significant chi-square difference test, $\Delta\chi^2(6) = 12.564$, $p = .051$. Results of the partially constrained model revealed that social anxiety was negatively related to life satisfaction in all country groups examined, but the magnitude of this relation was stronger in Norway compared to the other country groups (see Table 4).

4. Discussion

The primary goal of the present study was to assess the measurement invariance of the straightforwardly-worded version of the *Social Interaction Anxiety Scale* (S-SIAS; Mattick & Clarke, 1998) among samples of emerging adults attending university across 10 countries. To accomplish this goal, we employed the multiple-group factor analysis alignment method, which represents a more recent method for establishing approximate measurement invariance with large numbers of groups (Asparouhov & Muthén, 2014; Muthén & Asparouhov, 2014), compared to traditional techniques such as multigroup confirmatory factor analysis. Assuming invariance could be established, subsequent goals included examining mean differences across countries in social anxiety and exploring associations between social anxiety and life satisfaction.

To begin, findings revealed evidence of measurement invariance for the straightforwardly-worded version of the S-SIAS across the 10 country groups. To our knowledge, this is the first study to directly assess the measurement invariance of the straightforwardly-worded version of the S-SIAS across more than two countries, since previous multi-culture studies did not include a specific analysis to test the measurement invariance (e.g., Jefferies & Ungar, 2020; Jefferies et al., 2021; Schreier et al., 2010). Wong et al. (2019) did assess measurement invariance of the S-SIAS across samples of adults (aged 18 years and older) from Australia and Japan and reported partial equivalence for the S-SIAS. As well, the Japanese sample did not significantly differ from their Australian counterparts in terms of total social anxiety scores. Our findings suggest that the S-SIAS can be used to assess and directly compare social anxiety across a number of different countries.

Having established approximate measurement invariance of the S-SIAS across the ten countries included in the current study, we next sought to compare mean levels of social anxiety. Conflicting theoretical arguments have been forwarded as to whether social anxiety might be expected to be higher or lower in Western versus non-Western cultures (Dowbiggin, 2009; Kleinknecht et al., 1997; Schreier et al., 2010; Zhong et al., 2023). Results from the few studies directly comparing social anxiety across cultures have also been somewhat mixed (e.g., Jefferies & Ungar, 2020; Pietrabissa et al., 2020; Schreier et al., 2010; Stein et al., 2017). Our results showed that participants from Korea and Norway reported the highest social anxiety, whereas samples from Argentina, Turkey, and the US evidenced the lowest social anxiety scores. In this regard, a consistent pattern of Western versus non-Western cultures was not evident.

Notwithstanding, some of the results were consistent with previous theoretical assertions and empirical results. For example, among all ten countries, Norwegian university students reported the highest means of social anxiety. This finding is in line with the previously raised notion that an emphasis on privacy value and solitude in Norway may impact the establishment of supportive social relationships, which in turn may increase feelings of anxiety when social interactions occur (Braathu et al., 2022). Also, it has been argued that the Norwegian culture focuses on equality, discouraging people from being different from others and bragging about success (Cappelen & Dahlberg, 2018). This emphasis on equity might also serve to increase social anxiety during social interactions for those individuals who feel different and do not conform to the group. This may be particularly significant among university students when moving away from home and interacting with unfamiliar others (Braathu et al., 2022).

The observed differences between Norway and other nations could also be attributed to Norway's robust support systems for individuals experiencing psychological distress (Holte, 2024). Norwegian educational institutions systematically emphasize mental health literacy and adhere to the inclusive educational philosophy that all students shall be accommodated and included. This institutional approach potentially facilitates academic progression for students experiencing social anxiety. As a result, despite experiencing anxiety symptoms that may impair social functioning, more socially anxious individual in Norway may still access and engage with university environments.

In contrast, the sample from Argentina reported the lowest mean of social anxiety compared to all other countries. In Latin American countries, the cultural values of being polite, refraining from criticizing and rejecting others, and de-emphasizing negative social behaviors may translate into a gentler social landscape that evokes less social anxiety during social interactions (Holloway et al., 2009; Schreier et al., 2010). In Latin American countries there is also a greater acceptance of socially reticent behaviors, suggesting that those who live in these contexts may

[4] We computed separate ANOVAs for each country. Results revealed statistically significant differences in social anxiety for China (higher scores for males than females, $F(1, 780) = 4.623$, $p = .032$, $\eta^2 = .006$) and Canada (higher scores for females than males, $F(1, 559) = 7.977$, $p < .01$, $\eta^2 = .01$; see Table S2 in the supplementary materials). There were no significant sex differences for life satisfaction in the overall sample and in the eight countries.

[5] We controlled for participant sex in all models. The association between sex and life satisfaction was constrained to be equal across 8 country groups (no differences emerged in the model with sex not constrained to be equal across groups). We did not control for participant age since this information was not collected in Norway. The analyses did not include participants from Argentina and Australia as the Satisfaction with Life Scale was not collected in these samples.

Table 2
Factor mean comparisons of countries for the straightforwardly-worded social interaction anxiety scale.

Ranking	Country	Factor Mean	Group with significantly smaller factor mean								
1	NO	0.528	KO	CA	IN	CH	AU	IT	US	TU	AR
2	KO	0.320	CA	IN	CH	AU	IT	US	TU	AR	
3	CA	0.105	IT	US	TU	AR					
4	IN	0.050	US	TU	AR						
5	CH	0.029	US	TU	AR						
6	AU	0.000	US	TU	AR						
7	IT	−0.055	TU	AR							
8	US	−0.174	AR								
9	TU	−0.204	AR								
10	AR	−0.382									

Note. NO = Norway, KO = Korea, CA = Canada, IN = India, CH = China, AU = Australia (reference group), IT = Italy, US = USA, TU = Turkey, AR = Argentina. The means, ordered from high to low, are shown for the country groups that have factor means significantly different at the 5 % level. Average Invariance Index = 0.585; this index represents the degree of confidence for mean comparisons across the country groups, with values ranging from 0 (full non-invariance) to 1 (perfect scalar invariance).

Table 3
Means and standard deviations for social anxiety and life satisfaction by country.

	Social anxiety	Life satisfaction
Sites	*M (SD)*	*M (SD)*
Norway	1.83(0.65)	4.48(1.46)
Korea	1.71(0.75)	4.38(1.18)
Canada	1.50(0.88)	4.56(1.39)
Australia	1.46(0.81)	—
India	1.46(0.68)	5.03(1.21)
China	1.44(0.73)	4.05(1.26)
Italy	1.39(0.78)	4.44(1.37)
USA	1.27(0.84)	4.53(1.41)
Turkey	1.26(0.78)	4.01(1.33)
Argentina	1.09(0.64)	—
Overall Sample	1.41(0.79)	4.37(1.36)

Note. The life satisfaction measure was not administered in Argentina and Australia.

Table 4
Links between social anxiety and life satisfaction in the final multigroup regression analysis.

Country	Social anxiety → Life satisfaction		
	β(b)	95 % CI	*p*-value
Canada	−.35(−.55)	−.39, −.31	< .001
USA	−.33 (−.55)	−.37, −.30	< .001
Italy	−.32(−.55)	−.36, −.28	< .001
China	−.31(−.55)	−.34, −.27	< .001
India	−.31(−.55)	−.35, −.27	< .001
Turkey	−.32(−.55)	−.35, −.28	< .001
Korea	−.36(−.55)	−.41, −.31	< .001
Norway	**−.47(−1.054)**	**−.57, −.37**	**< .001**

Note. Standardized regression coefficients (β), their non-standardized coefficients (b), and their confidence intervals (95 % CI) are reported. Sex was constrained to be equal across country groups. In bold is the path that was not constrained to be equivalent to the other country groups. The life satisfaction measure was not administered in Argentina and Australia.

suffer less impairments generally related to these behaviors, thus reporting lower levels of social anxiety (Schreier et al., 2010).

Also of note, Argentina has internationally recognized public universities that are free of charge and there is not a widespread culture of migrating for higher education (Ministerio de Educación de la Nación, 2025). As a result, most students at Argentinian universities are local (Monroy, 2018), and thus more likely to be living at home (as compared to in dorms). It is possible that this context of additional familiarity and support serves to reduce feelings of social anxiety during the transition to university.

Another notable finding was that social anxiety was negatively related to life satisfaction in all cultural groups. This finding adds to the robust previous research linking social anxiety to poorer life satisfaction and other indicators of ill-being (Dryman et al., 2016; Eng et al., 2005; Olatunji et al., 2007). It also provides evidence in support of the construct validity of the S-SIAS for emerging adults attending university in the countries included in the sample. However, it is also of note that the magnitude of this association was stronger for Norway than among all other sites. In other words, the negative concomitants of social anxiety appeared to be the most pronounced in terms of satisfaction with life in Norway. University students during emerging adulthood might suffer from social anxiety due to the increased pressure, uncertainty, and challenges of university years (e.g., being away from home and building new social relationships) in a developmental period where there is the need to build close relationships in both personal and school contexts (Nelson & Millett, 2021). It is possible that the pronounced emphasis on privacy in Norway exacerbates the links between university students' social relationships and their life satisfaction (Braathu et al., 2022).

4.1. Limitations and future directions

This study was the first to directly assess the measurement invariance of the long form of the straightforwardly-worded version of the *Social Interaction Anxiety Scale* (S-SIAS; Mattick & Clarke, 1998; Rodebaugh et al., 2011; Wong et al., 2019) using multiple-group factor analysis alignment (Asparouhov & Muthén, 2014; Muthén & Asparouhov, 2018) in samples of emerging adults attending university across 10 countries. Our results indicated differences in mean social anxiety across countries, as well as variation in the strength of the association between social anxiety and life satisfaction. Notwithstanding, some limitations should be considered when interpreting our results, with an eye toward future studies.

First, we only considered students' self-reported social anxiety across countries as assessed by the S-SIAS. Despite the measurement invariance of the scale being established, our results do not speak to whether the SIAS is the most appropriate measure to capture the relevant aspects of social anxiety in each country. Indeed, although the S-SIAS represents one of the most used instruments for assessing social anxiety, items are likely most focused on the Western conceptualization of social anxiety, given that this measure was originally developed in Australia. For example, the S-SIAS does not include items assessing concerns with offending others, avoiding conflict with others, being respectful, and other facets of social anxiety that may be more prominent in non-Western culture (Dowbiggin, 2009; Kleinknecht et al., 1997). Thus, if we were to speculate, it is possible that this limitation may have differentially affected the assessment of social anxiety in some countries more than others, especially in collectivistic countries, where there is less fear of social evaluations than in individualistic countries, resulting in lower scores on the S-SIAS (i.e., Argentina versus Norway; Okawa et al., 2021). However, it should be noted that our findings did not

indicate consistent grouping between individualistic and collectivistic societies. For example, participants in Norway reported higher anxiety scores, followed by Korea, and then Canada. In this regard, additional studies comparing social anxiety scores across countries using other measures are required to further shed light on the mixed results reported across studies.

Furthermore, although we did not find significant sex differences in overall mean levels of social anxiety between females and males across the entire sample, our convenience sample was comprised of a greater proporion of females than males attending university in each country. As well, whereas females reported higher social anxiety scores than males in Canada, males reported higher social anxiety scores than females in China. This result is inconsistent with recent research indicating higher prevalence of social anxiety among females than males in China (e.g., Shao et al., 2025). To generalize results, future studies should not only include samples of emerging adults not attending university but also include a broader age range, more diverse and representative samples from each country, as well as additional cultures not represented in the current study. Relatedly, it will also be important to directly assess cultural values among the samples in each country. Although results revealed age differences across countries considered in the present study (e.g., older participants from India and Italy and younger participants from China), we did not control the analyses for participant age because this information was not collected in Norway. Also, we did not control for additional participant characteristics, such as being from out of town or living circumstances (e.g., student residence vs living with parents). Therefore, future studies should include samples of with a broader age range and not only from undergraduate introductory psychology courses. Students in their first year of university (and probably younger) might be expected to report higher levels of social anxiety than students in later years, when the university context becomes more familiar (Brook & Willoughby, 2015). Finally, since the present study is cross-sectional, future researchers should investigate the role of social anxiety in influencing life satisfaction over time.

In conclusion, the long version of the S-SIAS can be used as a valid instrument to compare social anxiety and its role in university students' life satisfaction across countries. Assessing and monitoring university students' social anxiety is important due to its substantive impact on quality of life during this unique and stressful period (Archbell & Coplan, 2022) and can help to ameliorate and expand intervention programs designed to assist students to combat anxiety during the transition to university.

Disclosure

Laura L. Ooi did not undertake the work under the auspices of the Public Health Agency of Canada as part of her employment responsibilities. The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

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Declaration of Competing Interest

We have nothing to declare.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.janxdis.2025.103092.

Data availability

The outputs of the analyses reported in the manuscript are available at the following OSF link: https://osf.io/kx9c8/overview?view_only=d938f418657e41e38cbb714b249fa288

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