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Measurement Instruments for the Social Sciences

INTERNATIONAL ADAPTATION OF MEASUREMENT INSTRUMENTS

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The Optimism–Pessimism Short Scale–2 (SOP2): a comprehensive validation of the English-language adaptation

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Abstract

The Optimism–Pessimism Short Scale–2 (SOP2) described in this article measures the psychological disposition of optimism with two items. SOP2 is the English-language adaptation of an originally for the German language developed scale. Because an empirical validation of this English-language SOP2 was hitherto lacking, the aim of the present study was to assess the psychometric properties (objectivity, reliability, validity) of the English-language adaptation and to investigate measurement invariance across both language versions using heterogeneous quota samples from the UK and Germany. Our results show that the English-language adaptation has satisfactory reliability coefficients and is correlated with 10 external variables in the study (e.g., self-esteem, Emotional Stability, life satisfaction). Moreover, scalar measurement invariance of the scale holds when comparing the UK and Germany, implying the comparability of latent (co)variances and latent means across the two nations. As an ultra-short scale with a completion time of < 20 s, SOP2 lends itself particularly to the assessment of dispositional optimism in survey contexts in which assessment time or questionnaire space are limited. It can be applied in a variety of research disciplines, such as psychology, sociology, or economics.

Keywords: Optimism, Pessimism, Expectations, Short scale, Validation

Introduction

Optimists and pessimists differ in their approach to the world (e.g., Carver et al., 2010). Whereas optimists look to the future with confidence and mostly expect good things to happen, pessimists are full of doubt when they look to the future and mostly expect bad things to happen. Dispositional optimism is positively related to many different areas of life, such as life satisfaction, health, employment status, and self-esteem (e.g., Hajek & König, 2019).

Studies investigating individual differences in optimism need a valid and efficient measure of this disposition, especially in research settings with severe time limitations. Motivated by this need, Kemper et al. (2013) developed a two-item German-language measure of dispositional optimism, the *Skala Optimismus–Pessimismus–2* (Optimism–Pessimism Short Scale–2; SOP2). As an ultra-short scale with a completion time of less than 20 s (estimated value),[1] SOP2 can be applied in a variety of research areas, particularly in settings with severe time limitations or other constraints on questionnaire length. The German-language SOP2 was validated in a large and diverse random sample of adults in Germany. As no comparable ultra-short scale for the measurement of dispositional optimism existed for the English-language context, the authors of the scale translated and adapted SOP2 to the English language in order to fill this gap and to broaden the range of possible applications of their scale. Because

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[1]The average completion time for one personality item typically ranges between 5 and 8 s.

the psychometric properties of this English-language version of SOP2 have not yet been investigated, we comprehensively validated the English-language SOP2 in the present study. Specifically, we analyzed its reliability and validity (based on evidence regarding the internal structure of the scale and the relationship between scores on the SOP2 scale and on 10 scales measuring other variables). Furthermore, we compared reliability and validity between the English- and German-language versions and evaluated the measurement invariance of SOP2 across both language versions using quota samples from the United Kingdom (UK) and Germany (DE) to determine the level of comparability of SOP2 in cross-cultural research.

Theoretical background

Definition and nomological network of dispositional optimism

People differ in their expectations for the future. Some people—the optimists—expect that good things will happen to them; others—the pessimists—expect that bad things will happen to them (Scheier & Carver, 1985). Dispositional optimism and pessimism affect all areas of life and represent stable personality traits (Scheier et al., 1994; Scheier & Carver, 1985).

Empirical evidence confirms that optimists and pessimists differ in their general approach to life and, as a consequence, experience different life outcomes (for an overview, see, e.g., Carver et al., 2010). The general pattern of findings suggests that because optimists have better self-regulation strategies than pessimists, higher levels of optimism are linked to favorable life outcomes (Scheier & Carver, 1985). Optimists employ coping strategies more flexibly than pessimists do (Nes & Segerstrom, 2006; Pavlova & Silbereisen, 2013). Moreover, because they expect more positive outcomes, they show greater persistence in the pursuit of goals (Nes et al., 2011). Consistent positive associations have been found, for instance, between dispositional optimism and life satisfaction (e.g., Hajek & König, 2019), health (e.g., Hajek & König, 2019), employment (e.g., Hajek & König, 2019), and income (e.g., Kemper et al., 2013).

However, dispositional optimism may not be universally positive: (Male) Optimists engage more often in risky behavior than do (male) pessimists (Felton et al., 2003). In general, higher dispositional optimism is associated with higher risk proneness (e.g., Barel, 2019). Furthermore, dispositional optimism has been shown to be consistently related to other personality characteristics. Optimism correlates positively with the Big Five personality traits, especially with Emotional Stability and Extraversion (e.g., Sharpe et al., 2011). It also correlates positively with self-esteem (e.g., Hajek & König, 2019), interpersonal trust (e.g., Mealy et al., 2015), and general self-efficacy (e.g., Hajek & König, 2019). Concerning beliefs about the general effectiveness of one's own behavior, optimism has been consistently found to be positively associated with internal locus of control and negatively with external locus of control (e.g., Guarnera & Williams, 1987).[2] With regard to beliefs about the political effectiveness of one's own behavior, previous research found optimism to be positively associated with internal and external political efficacy (e.g., Groskurth et al., 2021).[3]

In sum, dispositional optimism is associated with a broad range of life outcomes and with structural and dynamic aspects of personality. These correlations underline the potential relevance of dispositional optimism to many researchers who study human behavior and its consequences on the individual and societal level. Up to now, the literature has not yet arrived at a final consensus on the dimensionality of the construct. There is evidence that either a bipolar unidimensional (e.g., Kam & Meyer, 2012; Rauch et al., 2007; Segerstrom et al., 2011) or highly correlated two-dimensional structure underly the optimism–pessimism construct (e.g., Benyamini, 2005; Chang et al., 1997; Herzberg et al., 2006; Segerstrom et al., 2011).

One option to measure dispositional optimism either as a unidimensional or two-dimensional construct is the 10-item Life Orientation Test–Revised (LOT-R; Scheier et al., 1994). Because large-scale surveys usually operate under severe monetary and time constraints, Kemper et al. (2013) developed an even more economical ultra-short scale, the two-item German-language *Skala Optimismus–Pessimismus–2* (Optimism–Pessimism Short Scale–2; SOP2). The German-language SOP2 (Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014) has proved to be a psychometrically sound measure that is strongly correlated to LOT-R (r = .68) and allows for the measurement of dispositional optimism in about 20 s. Optimism and pessimism can either be interpreted as separate or bipolar dimensions with SOP2. Because of the strong correlation between optimism and pessimism (r = −.86) and the two facets' highly similar correlations with external variables (see Kemper et al., 2013), we interpreted SOP2 as a unidimensional, bipolar measure for dispositional optimism in the further course of this paper.

[2]Internal locus of control is understood as an individual's belief that an event is dependent on their own behavior or stable personality characteristics, whereas external locus of control is understood as an individual's belief that an event is the result of luck, chance, fate, or under the control of powerful others (Rotter, 1966).

[3]Internal political efficacy is defined as an individual's belief that means of political influence are available to them, whereas external political efficacy is defined as an individual's belief that the government is responsive to influence attempts (Balch, 1974).

SOP2 can be applied in a variety of research areas in psychology, sociology, economics, and related disciplines. Versions of SOP2 are available in English, Spanish, Italian, and Greek (Kemper et al., 2015). However, evidence for the psychometric quality of the English-language version has been missing to date.

Development of the SOP2 scale

For the development of the original, German-language SOP2 scale, Kemper et al. (2013; see also Kemper, Beierlein, Kovaleva, & Rammstedt, 2014) aimed to measure the construct with as few items as possible while still capturing the essential aspects of the definition of dispositional optimism proposed by Scheier and Carver (1985). These authors' definition is widely used and accepted in research on the construct. On that basis, Kemper et al. (2013) generated two items measuring confidence and generalized positive expectations about the future as well as doubt and generalized negative expectations about the future, respectively. Thereby, the wording of the items should contain the terms optimistic and pessimistic. These items underwent cognitive pretesting to ensure item clarity and comprehensibility for a broad range of potential study participants. The results of the pretest showed that there were individual differences in the interpretation of the terms optimistic and pessimistic. To reduce measurement error in item response and to increase content validity of the items, Kemper et al. (2013) prepended a brief definition of the respective construct to each item (for more detailed information, see Kemper et al., 2013; for the original German-language items, see Additional File 1 in the Supplementary Online Material; see also (Kemper, Beierlein, Kovaleva, & Rammstedt, 2014). The authors thoroughly validated the German-language SOP2 based on a large and diverse random sample representative of the adult population in Germany in terms of age, gender, and educational attainment.

To enable social scientists to use SOP2 in English-language surveys, the scale was adapted to the English language by Kemper, Beierlein, Kovaleva, and Rammstedt (2014). In a first step, the two items of SOP2 and their rating scales were translated into English following the TRAPD (Translation, Review, Adjudication, Pretesting, and Documentation; Harkness, 2003) approach. Two professional translators (English native speakers) translated the item wordings and the response scale labels independently of each other into British English and American English, respectively. Second, an adjudication meeting was held in which psychological experts, the two translators, and an expert in questionnaire translation reviewed the translation proposals and developed the final translation.

The English-language items are displayed in Table 1 and in Additional File 2 in the Supplementary Online Material. As in the German-language source instrument, Item 1 is positively worded in relation to the construct dispositional optimism, and Item 2 is negatively worded. Both items are answered using a 7-point rating scale ranging from *not at all optimistic* (1) to *very optimistic* (7) for Item 1 and from *not at all pessimistic* (1) to *very pessimistic* (7) for Item 2. To obtain an optimism scale score, the negatively worded item is recoded ($y_{\text{recoded}} = 8 - y_{\text{original}}$), and the unweighted mean score of the two items is computed.[4]

The empirical validation of this English-language SOP2 was hitherto lacking. The aim of the present study is to make this evidence for the psychometric quality of the English-language SOP2 available to researchers who intend to use the adaptation for their research in English-language samples or as part of cross-cultural comparisons. We addressed several aspects of psychometric quality, that is, scale reliability, different types of validity evidence (regarding the internal structure of the scale and the relationship between scores on SOP2 and on 10 scales measuring other constructs), and measurement invariance of the English-language adaptation by analyzing the data of two large quota samples from the UK and Germany. In view of the good psychometric quality of the German-language source version, we expected to find similar reliability estimates and validity evidence for the English-language adaptation and to be able to confirm the internal structure of this adaptation.

Method

Samples

To investigate the psychometric properties of the English-language adaptation of SOP2 and their comparability with those of the German-language source instrument, we assessed both versions in a Web-based survey (using computer-assisted self-administered interviewing [CASI]) that was conducted in the UK and Germany by the online access panel provider respondi AG. Data collection took place in January 2018. For both nations, quota samples were drawn that represented the heterogeneity of the adult population in terms of age, gender, and educational attainment. Data from the last German Census (2011) were used as a reference (https://ergebnisse.zensus2011.de/?locale=en). To avoid bias introduced by a lack of reading/language proficiency, only native speakers of the respective languages were

[4]We suggest that individual answers should be aggregated to the scale level only if there are no missing values on any of the two items. If there are missing values, we recommend using appropriate methods for handling missing data, such as multiple imputation (e.g., Baraldi & Enders, 2013) or full information maximum likelihood estimation (FIML; e.g., Rose et al., 2019).

Table 1 Wording of English-language SOP2 items

No.	Item	Polarity
1	The next question deals with optimism. Optimists are people who look to the future with confidence and who mostly expect good things to happen. How would you describe yourself? How optimistic are you in general?	+
2	The next question is about pessimism. Pessimists are people who are full of doubt when they look to the future and who mostly expect bad things to happen. How would you describe yourself? How pessimistic are you in general?	–

Note. The items are not preceded by a general instruction. Rather, each item begins with a brief definition of the respective construct, in order to ensure that all respondents understand the terms *optimism* and *pessimism* in the same way

recruited. We explained our research goal (investigation of the quality of several questionnaires) to the participants. Respondents received a small financial reward for their participation. In both nations, a subsample was reassessed after around 3 to 4 weeks (median time intervals: 28 days in the UK and 20 days in Germany).

Only respondents who completed the full questionnaire—that is, who did not abort the survey prematurely—were included in our analyses. To handle missing values on individual items (of SOP2 or other variables included in the survey), we used full-information maximum likelihood (FIML) estimation in our analyses. The gross sample sizes were N_{UK} = 508 (retest: N_{UK} = 117) and N_{DE} = 513 (retest: N_{DE} = 125). In the next step, invalid cases were excluded based on three complementary criteria: (a) ipsatized variance—that is, the within-person variance across items (Kemper & Menold, 2014)—if the person fell within the lower 5% of the sample distribution of ipsatized variance; (b) the Mahalanobis distance of a person's response vector from the average sample response vector (Meade & Craig, 2012) if the person fell within the upper 2.5% of the sample distribution of the Mahalanobis distance[5]; and (c) implausibly short response times, namely, if the person took, on average, less than 1 s to respond to an item. Our intention in choosing relatively conservative cut-off values was to exclude as many careless responders as possible while preserving valid cases. All exclusion criteria were applied simultaneously—that is, any respondent who violated one or more of the three criteria was excluded from the analyses, and only those who met all three criteria were included.[6] This approach resulted in the exclusion of 40 cases (7.9%) from the UK subsample and 39 cases (7.6%) from the German subsample, thereby yielding net sample sizes of N_{UK} = 468 (retest: N_{UK} = 111) and N_{DE} = 474 (retest: N_{DE} = 117). Table 2 depicts in detail the sample characteristics and their distribution.

Materials

The online surveys were conducted in German for the German sample and in English for the UK sample. Study questionnaires comprised the respective language version of SOP2, a set of questions on sociodemographic characteristics (i.e., gender, age, highest level of education, income[7], and employment status), and numerous measures to enable us to subsequently examine the relationship between scores on SOP2 and on scales measuring other constructs. As SOP2 was part of a comprehensive multi-theme survey, our choice of correlates was driven by theoretical considerations and data availability.

On theoretical grounds, we selected, first, constructs that reflect general psychological dispositions and resources: (a) the Big Five personality traits, (b) risk proneness, (c) general self-efficacy, (d) self-esteem, (e) internal and external locus of control, (f) interpersonal trust, and (g) internal and external political efficacy. Second, we selected constructs that reflect quality of life variables: (h) life satisfaction and (i) health. As outlined in the theoretical background, previous research has found that all these constructs consistently correlate with dispositional optimism. Accordingly, we expected dispositional optimism to correlate positively with the Big Five personality traits (the highest with Emotional Stability and Extraversion), risk proneness, general self-efficacy, self-esteem, internal locus of control, interpersonal trust, internal and external political efficacy, life satisfaction, and health, as well as negatively with external locus of control. Third, we examined the susceptibility of SOP2 to two aspects of (j) socially desirable responding (exaggerating positive qualities and minimizing negative qualities) and, hence, a possible distortion of respondents' answers.[8] All short-scale measures, which were also administered as part of the survey in the respective language

[5]To identify outliers, we looked at the boxplots of the Mahalanobis distance. For the exclusion criterion of the top 2.5%, we found that there were no large outliers in the boxplot of Mahalanobis distance after case exclusion.

[6]Before case exclusion, we correlated the Mahalanobis distance and the ipsatized variance. There was a high positive correlation of approximately .60 in both samples indicating that the two indicators appeared to complement each other well by excluding different non-valid cases.

[7]To assess income, respondents were asked to allocate their net income to one of 18 categories ranging from 1 (*less than £200* [DE: *300 euros*]) to 17 (*£10,000* [DE: *10,000 euros*] *and more*), with the additional category 18 (*no personal income*). None of the participants chose the 18th category.

[8]Because SOP2 was administered as part of a comprehensive online survey for the validation of various short scales, there was no room for other validation scales that also assess dispositional optimism. However, previous evidence has shown that the German-language source scale of SOP2 correlates highly (r = .68) with an established longer optimism scale, the LOT-R (Scheier et al., 1994; see Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014).

Table 2 Sample characteristics by nation

	United Kingdom	Germany
N	468	474
Mean age in years (*SD*) [Range]	45.2 (14.5) [18–69]	44.0 (14.4) [18–69]
Proportion of women (%)	52.6	50.0
Educational level (%)		
Low: never went to school, Skills for Life/1–4 GCSEs A*–C or equivalent	34.8	33.5
Intermediate: 5 or more GCSEs A*–C/ vocational GCSE/GNVQ intermediate or equivalent	32.1	33.8
High: 2 or more A-levels or equivalent	33.1	32.7

Note. The equivalent German educational levels were as follows (from low to high): *ohne Bildungsabschluss/Hauptschulabschluss* [no educational qualification/basic school-leaving qualification], *Mittlere Reife* [intermediate school-leaving qualification], and *Fachhochschulreife/Abitur* [entrance qualification for a university of applied sciences/general higher education entrance qualification].

version, exhibit satisfactory psychometric quality criteria and are described in more detail in Table 3.

Before computing the correlations, we recoded Item 2 of SOP2, the minimizing negative qualities dimension of socially desirable responding (for both language versions), the health variable (for both language versions), and the self-esteem scale (UK only) so that high values represented dispositional optimism, high socially desirable responding, high health values, and high self-esteem, respectively. Because the Big Five dimension Emotional Stability is negatively worded in relation to the construct Negative Emotionality in the BFI-2-XS, we also recoded the respective items so that high values represented the positive pole of this dimension—that is, Emotional Stability. In addition, we recoded the employment status variable and tested four contrasts: (a) self-employed versus employed, (b) unemployed (out of work and looking for work/out of work but not currently looking for work) versus (self-) employed, (c) retired/homemaker versus (self-)employed, and (d) pupil/student/apprentice/intern versus (self-)employed.

Analysis

To empirically examine the English-language adaptation of SOP2 and to investigate its comparability with the German-language source version, we analyzed psychometric properties (objectivity, reliability, and validity) in both language versions as well as measurement invariance across both nations. We ran all statistical analyses with R. The R code can be found in Additional File 3 in the Supplementary Online Material.

As estimates for the reliability of SOP2, we computed McDonald's omega (ω; McDonald, 1999; Raykov, 1997) using the R package "semTools" (Jorgensen et al., 2019). In addition, we computed the test–retest stability, r_{tt}, over a period of about 28 days (*Mdn*) in the UK (N_{UK} = 111) and of 20 days (*Mdn*) in Germany (N_{DE} = 117), respectively. Our reasoning was that this time span of 3 to 4 weeks was long enough to allow for meaningful test–retest stability estimates and short enough to preclude the occurrence of pronounced and systematic change in the true scores of dispositional optimism. Because the test–retest stability is sensitive not only to measurement error but also to state fluctuations in dispositional optimism (e.g., Allen & Yen, 2002), the resulting reliability coefficient is best understood as a lower-bound estimate of reliability.

We investigated the factorial structure of SOP2 separately in the UK and Germany by means of confirmatory factor analyses (CFA) using the R package "lavaan" (Rosseel, 2012). We tested three different models, described below, and estimated all models with robust maximum likelihood (MLR) estimation. Furthermore, we computed evidence based on the relationship between scores on SOP2 and on scales measuring other variables based on manifest indicators (scale scores). Therefore, the reported correlations are subject to attenuation and represent the lower bound of the true associations.

Moreover, we assessed the comparability of SOP2 across both nations via measurement invariance tests with multiple-group confirmatory factor analysis (MG-CFA; Vandenberg & Lance, 2000; Widaman & Reise, 1997). Metric invariance is given if the number of factors, the loading patterns, and the factor loadings are the same across groups, implying the comparability of correlations based on the latent factors across nations. Scalar invariance is given if, in addition, the item intercepts are the same across groups, implying the comparability of latent (co)variances and latent means across nations. Uniqueness invariance is given if, in addition, the residual variances are the same across groups, implying the comparability of manifest scale scores and correlations across nations without systematic bias (e.g., Bluemke et al., 2016). In order to determine the level of measurement invariance, we used the cut-off values recommended by Chen (2007). According to these benchmarks, metric invariance must be rejected when ΔCFI [comparative fit index] ≤ −.010 in accordance with ΔRMSEA [root mean square error of approximation] ≥ .015, or ΔSRMR ≥ .030. Scalar and uniqueness invariance must be rejected when ΔCFI ≤ −.010 in accordance with ΔRMSEA ≥ .015, or ΔSRMR ≥ .010. A significant χ^2 difference test is also an indicator of metric, scalar, and uniqueness non-invariance.

Results

Descriptive statistics and reference ranges

In the first step, we analyzed the descriptive statistics and reference ranges separately for the German- and English-language versions of SOP2. Table 4 shows the means, standard deviations, skewness, and kurtosis for

Table 3 Short-scale measures used in the survey correlated with SOP2

Construct	Short scale measure	Subdimensions	No. of items	Reliability estimates
Big Five personality traits	Extra-short form of the Big Five Inventory–2 (BFI-2-XS; English-language version: Soto & John, 2017; German-language version: (Rammstedt et al., 2020)	Extraversion, Agreeableness, Conscientiousness, Emotional Stability, Openness	15 (3 items per dimension)	UK sample: between α = .44 (Openness) and α = .79 (Emotional Stability), German sample: between α = .37 (Agreeableness) and α = .68 (Emotional Stability)
Risk proneness	Risk Proneness Short Scale (R-1; Nießen, Groskurth, et al., 2020b)/Kurzskala zur Erfassung der Risikobereitschaft (Beierlein, Kovaleva, Kemper, & Rammstedt, 2015)	-	1	r_{tt} = .76 (English-language version), r_{tt} = .83 (German-language version; Nießen, Groskurth, et al., 2020b)
General self-efficacy	General Self-Efficacy Short Scale–3 (GSE-3; Doll et al., 2021)/Allgemeine Selbstwirksamkeit Kurzskala (ASKU; Beierlein, Kovaleva, et al., 2014)	-	3	ω = .92 (English-language version), ω = .86 (German-language version; Doll et al., 2021)
Self-esteem	Rosenberg Self-Esteem Scale (RSES; English-language version: Rosenberg, 2014; German-language version: von Collani & Herzberg, 2003)	-	10	UK sample: α = .90, German sample: α = .89
Locus of control	Internal–External Locus of Control Short Scale–4 (IE-4; Nießen et al., 2021)/Internale–Externale-Kontrollüberzeugung–4 (Kovaleva et al., 2014)	Internal locus of control, external locus of control	4 (2 items per dimension)	ω = .59–.63 (English-language version), ω = .59–.67 (German-language version; Nießen et al., 2021)
Interpersonal trust	Interpersonal Trust Short Scale (KUSIV3; Nießen, Beierlein, et al., 2020)/Kurzskala Interpersonelles Vertrauen (Beierlein, Kemper, et al., 2014a)	-	3	ω = .69 (English-language version), ω = .75 (German-language version; Nießen, Beierlein, et al., 2020)
Political efficacy	Political Efficacy Short Scale (PESS; Groskurth et al., 2021)/Political Efficacy Kurzskala (PEKS; Beierlein, Kemper, et al., 2014b)	Internal political efficacy, external political efficacy	4 (2 items per dimension)	ω = .84–.88 (English-language version), ω = .86 (German-language version; Groskurth et al., 2021)
Life satisfaction	General Life Satisfaction Short Scale (L-1; Nießen, Groskurth, et al., 2020a)/Kurzskala zur Erfassung der Allgemeinen Lebenszufriedenheit (Beierlein, Kovaleva, László, et al., 2015)	-	1	r_{tt} = .82 (English-language version), r_{tt} = .71 (German-language version; Nießen, Groskurth, et al., 2020a)
Health	Question measuring self-reported general health used in the European Social Survey (ESS; English-language version: ESS, 2016a; German-language version: ESS, 2016b)	-	1	-
Socially desirable responding	Social Desirability–Gamma Short Scale (KSE-G; Nießen et al., 2019)/Soziale Erwünschtheit–Gamma (Kemper, Beierlein, Bensch, et al., 2014)	Exaggerating positive qualities, minimizing negative qualities	6 (3 items per dimension)	ω = .67–.79 (English-language version), ω = .69–.70 (German-language version; Nießen et al., 2019)

the two items as well as for the aggregate score, separately for the UK and German samples. All descriptive statistics were comparable across the two languages. The inter-item correlations were as follows: UK—r_{12} = .51, DE—r_{12} = .63 (for both correlations: p < .001). Additional File 4 in the Supplementary Online Material provides the reference ranges in terms of the means, standard deviations, skewness, and kurtosis of the SOP2 scale scores for the total population as well as separately for gender and age groups in both nations.

Objectivity

A scale can be regarded as objective when it works (a) independently of the administrator (objectivity of application), (b) independently of the evaluator of the instrument (objectivity of evaluation), and (c) when unambiguous and user-independent rules are provided (objectivity of interpretation). The standardized questionnaire format and written instructions, the fixed scoring rules and labeled response categories, and the reference ranges ensured the objectivity of the application, evaluation, and interpretation of SOP2.

Reliability

The reliability estimates for SOP2 were ω = .68 and r_{tt} = .74 ($CI_{95\%}$: .64 < r_{tt} < .81) for the UK and ω = .77 and r_{tt} = .77 ($CI_{95\%}$: .68 < r_{tt} < .83) for Germany. As often occurs with (ultra-)short scales, test–retest reliability was minimally higher than internal consistency for the UK, whereas it was the same for the German sample. In detail, SOP2 proved to be slightly more reliable in the German sample than in the UK sample. Because internal

Table 4 Descriptive statistics by nation for the SOP2 items

	M		*SD*		Skewness		Kurtosis	
	UK	DE	UK	DE	UK	DE	UK	DE
Aggregate scale score	4.41	4.64	1.41	1.36	−0.39	−0.35	−0.20	−0.43
Item 1	4.50	4.71	1.55	1.44	−0.56	−0.50	−0.19	−0.20
Item 2	4.32	4.57	1.69	1.56	−0.22	−0.30	−0.90	−0.75

Note. The rating scale ranged from 1 (*low*) to 7 (*high*). UK = United Kingdom (N = 468), DE = Germany (N = 474)

consistency estimates vary across groups, test–retest correlations are recommended for a comparison of the reliability of scale scores. Especially given the small number of items, both reliability estimates (ω and r_{tt}) are satisfactory and sufficient for research purposes (Aiken & Groth-Marnat, 2006; Kemper et al., 2019).

Validity

Content-related validity evidence was provided by Kemper et al. (2013) and Kemper, Beierlein, Kovaleva, and Rammstedt (2014) during the original scale development process. In addition, we investigated two types of validity evidence—namely, evidence based on the internal structure of the scale and evidence based on the relationship between scores on the SOP2 scale and on scales measuring other variables.

Validity evidence based on the internal structure of SOP2

We tested the factorial structure of SOP2 with three different models, which are depicted in Fig. 1. Our rationale was to examine whether the item scores captured sufficient common variance to warrant a unidimensional interpretation of the construct and the aggregation of both single-item scale scores. Because SOP2 comprises only two items, a unidimensional model with equal loadings (i.e., an essentially tau-equivalent model) is just-identified. Therefore, we tested models with the items measured at two occasions to be able to evaluate model fit and to test whether the models developed for the original German-language scale were replicable.

The first models we estimated were two hierarchical measurement models for repeated measures initially developed by Kemper, Beierlein, Kovaleva, and Rammstedt (2014) and Kemper et al. (2013) in their publications of the German-language source version of SOP2. The third model we estimated was the unidimensional model.

Model I The first model consisted of two first-order factors and one second-order factor capturing generalized positive expectations. The first-order optimism factor consists of the optimism item at two measurement occasions; the first-order pessimism factor consists of the pessimism item at two measurement occasions. We identified the model by constraining the first factor loading of each factor to 1 and the factor loadings within each factor to equality. The fit indices refer to the commonly used MLR-scaled CFI and RMSEA, which are functions of the MLR-adjusted chi-square statistic and lead to biased population values (Brosseau-Liard et al., 2012; Brosseau-Liard & Savalei, 2014). According to the benchmarks of Hu and Bentler (1999), the model fit was good for Germany, whereas it was borderline acceptable for the UK, with a slightly too high RMSEA. Following Browne and Cudeck (1992), who reported more differentiated cut-offs for RMSEA, RMSEA was still acceptable: UK—$\chi^2(3) = 15.291$, $p < .01$, CFI = .935, RMSEA = .094, SRMR (standardized root mean square residual) = .069, BIC (Bayesian information criterion) = 4,131.665; DE—$\chi^2(3) = 4.637$, $p = .200$, CFI = .993, RMSEA = .034, SRMR = .054, BIC = 3,949.892.[9] The size of the items' factor loadings, the measurement errors, and the mean structure are depicted in Fig. 1A.

Model II Because the fit of the previous model was only borderline acceptable in the UK, we next tested another hierarchical model. Following Kemper et al. (2013), besides the content factors, we additionally specified wave-specific method factors, in the sense that the optimism and pessimism items of the first measurement time load on one factor and both items of the second measurement time load on a second factor. In line with Kemper et al. (2013), we applied the following model constraints: (a) equalizing the factor loadings within each factor (i.e., content and method factors), (b) equalizing the error variances of the items of one factor (i.e., content factor), and (c) not allowing the content and method factors to correlate (i.e., setting these correlations to 0). We diverged slightly from Kemper et al.'s (2013) approach because we (d) identified our model by setting the factor loadings instead of the factor variances to 1 and (e) captured the correlation between the (first-order) optimism and pessimism factors in a second-order factor with equal loadings. However, our model is technically equivalent to the model of Kemper et al. (2013). The fit indices should not diverge between the different

[9] R/lavaan additionally provides so-called robust CFI and robust RMSEA values that prevent biased fit indices (Brosseau-Liard et al., 2012; Brosseau-Liard & Savalei, 2014): UK—robust CFI = .967, robust RMSEA = .088; DE—robust CFI = .994, robust RMSEA = .040.

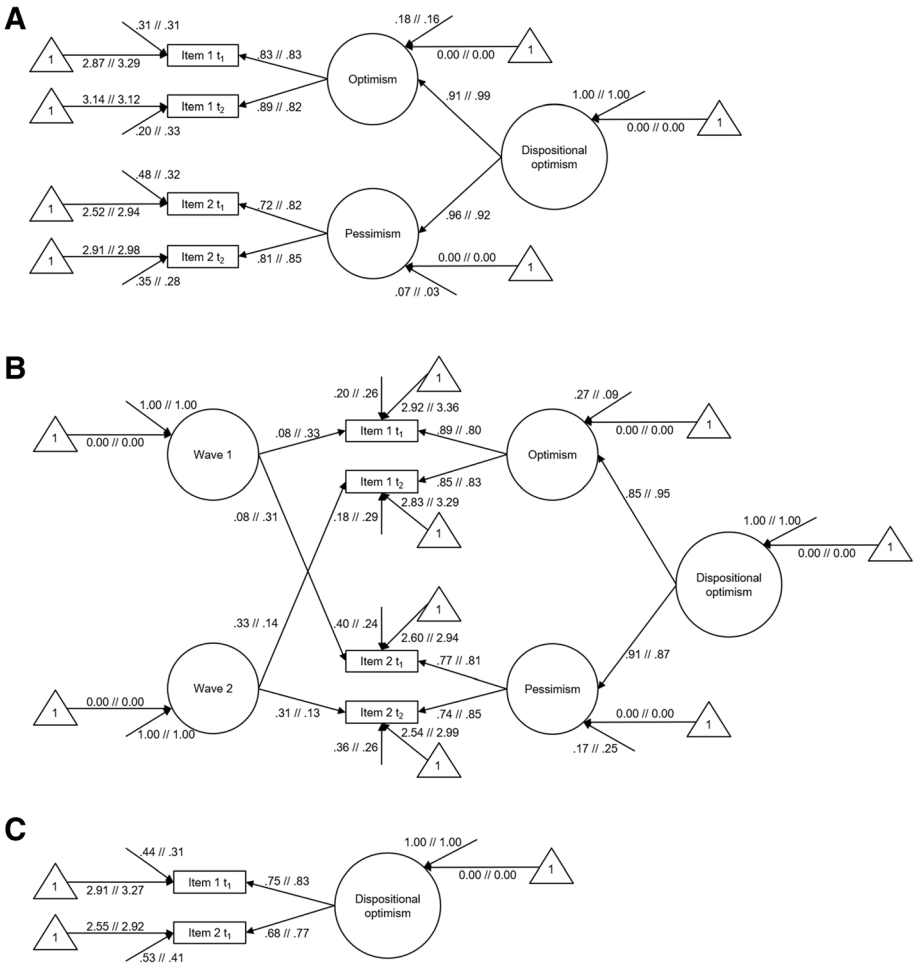

Fig. 1 Measurement models of SOP2 with standardized coefficients and equalized factor loadings. The negatively worded item is reverse-scored. The coefficients of the German sample are presented after the double slash. N_{UK} = 468, N_{DE} = 474. **A:** Hierarchical two-factor measurement model. **B**: Hierarchical two-factor measurement model with wave-specific method factors. **C:** Unidimensional measurement model

identification and modeling strategies and proved to be better than the previous model for both nations: UK—$\chi^2(3)$ = 10.728, p < .05, CFI = .959, RMSEA = .074, SRMR = .053, BIC = 4,135.192; DE—$\chi^2(3)$ = 1.419, p = .702, CFI = 1.000, RMSEA = .000, SRMR = .018, BIC = 3,944.921.[10] The size of the items' factor loadings, the measurement errors, and the mean structure are depicted in Fig. 1B.

Model III The aforementioned model developed by Kemper et al. (2013) showed good fit. However, it requires two measurement occasions with the same respondents, which is not always feasible. Therefore, we additionally present an alternative unidimensional measurement model with one latent factor capturing generalized positive expectations. This model does not require a second measurement occasion. Because a latent measurement model with only two items and no further restrictions is not identified, we estimated an essentially tau-equivalent model setting the factor loadings to 1. Hence, the model is just-identified (df = 0), meaning that it calculates the closed-form solution for the parameters, and we could not evaluate a model fit. Only a multigroup model with equivalence restrictions provides an interpretable model fit (see the "Cross-National, Cross-Gender, and Cross-Age Comparability" section). The size of the items' factor loadings, the measurement errors, and the mean structure are depicted in Fig. 1C.

Validity evidence based on the relationship between scores on SOP2 and on scales measuring other variables

The correlation coefficients between scores on SOP2 and on other scales are depicted in Table 5. Their interpretation is based on effect size guidelines proposed by Gignac and Szodorai (2016): relatively small effects (r ≥

[10] UK—robust CFI = .959, robust RMSEA = .093; DE—robust CFI = 1.000, robust RMSEA = .000.

.10), typical (medium) effects ($r \geq .20$), and relatively large effects ($r \geq 30$). According to these authors, a correlation of .20 corresponds to the 50th percentile of a meta-analytical distribution of correlations in individual differences research. Therefore, in Table 5, medium to large effects are highlighted. In order to investigate this type of evidence, we correlated scores on SOP2 with scores on the scales measuring the other constructs outlined in the "Materials" section.

In both nations, dispositional optimism showed the strongest positive association ($r > .50$) with self-esteem, the Big Five dimension Emotional Stability, and life satisfaction. This is in line with previous findings that individuals high in self-esteem (e.g., Hajek & König, 2019; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014), Emotional Stability (e.g., Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014; Sharpe et al., 2011)), and life satisfaction (e.g., Hajek & König, 2019;Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014) have a higher propensity for also reporting more optimistic expectations.

The second-highest correlations, which were again similar across both nations, were large positive associations ($.30 < r < .50$) between optimism and interpersonal

Table 5 Correlations of SOP2 with validation measures and sociodemographic characteristics, by nation

	UK		DE	
	r	95% CI	*r*	95% CI
Big Five				
Extraversion	**.38**	[.30, .45]	**.24**	[.15, .32]
Agreeableness	**.27**	[.19, .36]	**.28**	[.19, .36]
Conscientiousness	.19	[.10, .28]	.13	[.04, .21]
Emotional Stability	**.55**	[.48, .61]	**.55**	[.49, .61]
Openness	**.20**	[.12, .29]	.16	[.07, .24]
Risk proneness	**.20**	[.11, .28]	**.21**	[.12, .30]
General self-efficacy	**.31**	[.22, .39]	**.36**	[.28, .43]
Self-esteem	**.56**	[.50, .62]	**.57**	[.50, .62]
Locus of control				
Internal	**.27**	[.18, .35]	**.28**	[.20, .36]
External	−.18	[−.27, −.09]	**−.39**	[−.47, −.31]
Interpersonal trust	**.42**	[.35, .49]	**.43**	[.35, .50]
Political efficacy				
Internal	**.20**	[.11, .28]	**.22**	[.13, .30]
External	.13	[.04, .22]	.13	[.04, .21]
Life satisfaction	**.53**	[.46, .59]	**.51**	[.44, .58]
Health	**.32**	[.24, .40]	**.34**	[.25, .41]
Social desirability				
Exaggerating positive qualities	**.27**	[.19, .35]	**.23**	[.14, .31]
Minimizing negative qualities	.08	[−.01, .17]	.14	[.05, .23]
Sociodemographic characteristics				
Employed (= reference category)				
Unemployed	**−.22**	[−.32, −.12]	−.14	[−.25, −.03]
Self-employed	−.05	[−.16, .07]	.00	[−.11, .12]
Retired/homemaker	−.06	[−.16, .04]	−.07	[−.16, .03]
Pupil/student/apprentice/intern	−.07	[− .19, .04]	−.08	[−.18, .03]
Income	**.25**	[.16, .33]	**.21**	[.12, .29]
Educational level	.11	[.02, .20]	.08	[−.01, .17]
Age	.06	[−.03, .15]	.13	[.04, .21]
Gender	−.06	[−.15, .03]	.01	[−.08, .10]

Note. UK = United Kingdom (N = 468, $N_{\text{Employment status}}$ = 450, N_{Income} = 431), DE = Germany (N = 474, $N_{\text{Self-esteem}}$ = 473, $N_{\text{Employment status}}$ = 462, N_{Income} = 449), CI = confidence interval. Health: *very bad* (1) – *very good* (5). Gender: 1 = male, 2 = female. Coefficients with $r \geq |.20|$ are in bold type

trust (see, e.g., Beierlein, Kemper, et al., 2014a; Mealy et al., 2015; Schweer, 2006), health (see, e.g., Hajek & König, 2019; Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014; Rasmussen et al., 2009), general self-efficacy (see, e.g., Hajek & König, 2019; Beierlein, Kovaleva, et al., 2014; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014; Luszczynska et al., 2005), and Big Five Extraversion (in DE, it was only a medium effect; see, e.g., Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014; Sharpe et al., 2011).

Regarding locus of control, previous research has suggested positive correlations between optimism and internal locus of control and negative correlations between optimism and external locus of control (e.g., Guarnera & Williams, 1987; Kemper et al., 2015; Kovaleva et al., 2014). We could replicate this pattern for both nations with small-to-large-sized effects.

With respect to the other constructs, we also found substantial small-to-medium-sized positive correlations between optimism and Big Five Agreeableness and Openness, and between optimism and risk proneness. This is consistent with previous findings indicating that individuals high in Agreeableness (e.g., Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014; Sharpe et al., 2011), Openness (e.g., Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014)), and risk proneness (e.g., Barel, 2019; Beierlein, Kovaleva, Kemper, & Rammstedt, 2015; Kemper et al., 2015) also tend to have more optimistic expectations.

Furthermore, dispositional optimism also showed medium-sized positive correlations with internal political efficacy and the *exaggerating positive qualities* subdimension of socially desirable responding. The aforementioned subdimension depicts the self-deceptive enhancement component of communion-induced socially desirable responding (Nießen et al., 2019).

We calculated correlations between SOP2 and relevant sociodemographic characteristics, namely, employment status, income, educational level, age, and gender. In the present analyses, consistent across the two nations, we found medium-sized positive correlations with income. This finding is in line with evidence from Kemper et al. (2013) and Kemper, Beierlein, Kovaleva, and Rammstedt (2014) indicating that the tendency to report higher optimistic expectations increases with increasing income. Moreover, in both nations, there were small-to-medium negative associations between optimism and unemployment. Employed individuals had a higher propensity for dispositional optimism than unemployed ones (see, e.g., Hajek & König, 2019).

Overall, the pattern of correlations suggests that the evidence based on the relationship between scores on the English-language version of SOP2 and on scales/items measuring other variables was similar to that of the German-language source version. This evidence was also confirmed by the meta-correlation of r = .97, 95% CI [.94, .99], across the UK and Germany (i.e., the correlation of all correlations across nations).

Cross-national, cross-gender, and cross-age comparability

We assessed the comparability of SOP2 across the UK and Germany, across gender, and across age groups via measurement invariance tests. Because it is the most economical model, we based the measurement invariance tests on the essentially tau-equivalent unidimensional model with equal loadings (Model III) using MLR estimation. Therefore, the configural model and the metric model are equivalent. We identified the mean structure of the model by fixing the first intercept to 0 and the factor loadings to 1. As mentioned above, this model has zero degrees of freedom; therefore, no misfit can occur.

First, we assessed cross-national comparability. When comparing the scalar model with the metric model, SRMR as well as MLR-scaled CFI and RMSEA indicated that the scalar measurement invariance of SOP2 holds across the UK and Germany: $\Delta\chi^2(1) = 0.162$, $p = .687$, ΔCFI = .000, ΔBIC = −6.686, ΔRMSEA = .000, ΔSRMR = .004.[11] Uniqueness invariance did not hold when comparing the uniqueness model and the scalar model: $\Delta\chi^2(3) = 15.911$, $p < .001$, ΔCFI = −.088, ΔBIC = 8.455, ΔRMSEA = .102, ΔSRMR = .033.[12] The highest measurement invariance level we found—scalar measurement invariance—implies the comparability of latent (co)variances and latent means between both nations.

Second, we assessed cross-gender and cross-age comparability of SOP2 within both nations. Additional File 5 in the Supplementary Online Material provides the results of these measurement invariance tests. In both nations, we found that uniqueness invariance holds for gender, implying the comparability of manifest scale scores (means and variances) and correlations across gender without systematic bias (e.g., Bluemke et al., 2016). For age, scalar invariance did not hold in both nations. Thus, the three age groups did not have the same point of origin. Freely estimating the intercept of the optimism item in age group two led to a good model fit, indicating partial scalar measurement variance of SOP2 across age. In the UK, the intercept of the optimism item was much lower in age group two (30–49 years) than in the other two age groups (18–29 and 50–69 years), whereas it was the opposite in Germany, namely

[11] Δ robust RMSEA = .000. Metric model: $\chi^2(0) = 0.000$, CFI = 1.000, RMSEA = .000 [robust RMSEA = .000], SRMR = .000, BIC = 6696.390. Scalar model: $\chi^2(1) = 0.162$, $p = .687$, CFI = 1.000 [robust CFI = 1.000], RMSEA = .000 [robust RMSEA = .000], SRMR = .004, BIC = 6689.704.

[12] Δ robust CFI = −.048, Δ robust RMSEA = .115. Uniqueness model: $\chi^2(3) = 17.698$, $p = .001$, CFI = .912 [robust CFI = .952], RMSEA = .102 [robust RMSEA = .115], SRMR = .037, BIC = 6698.159.

a higher intercept for the intermediate age group two than for the youngest and oldest age groups.

Discussion and conclusion

The aim of the present study was to empirically assess the psychometric properties of the Optimism–Pessimism Short Scale–2 (SOP2), an English-language adaptation of the German-language *Skala Optimismus–Pessimismus–2* (Kemper et al., 2013), to compare these psychometric properties with those of the German-language source version, and to investigate measurement invariance across the UK and Germany. The ultra-short scale measuring dispositional optimism was constructed for use in assessment settings with severe time limitations, such as large-scale surveys. Our results—based on two comprehensive samples representing the heterogeneity of the adult populations in the UK and Germany—revealed, first, that the English-language version of SOP2 is a reliable and valid ultra-short instrument for measuring dispositional optimism and, second, that the psychometric properties of the English-language adaptation of SOP2 are comparable with those of the German-language source version.

In detail, we were able to replicate the hierarchical two-dimensional structure of dispositional optimistic and pessimistic expectations that Kemper et al. (2013) postulated and confirmed when constructing the original German-language SOP2. The hierarchical two-dimensional model has three degrees of freedom and can be applied if there are two measurement occasions available. In addition, we fit a simpler unidimensional measurement model capturing generalized positive expectations. The latter model does not require SOP2 to be measured at two occasions; in this sense, it can be seen as more economical model. In addition, the reliability estimates indicate that the scale scores for the English-language adaptation are acceptable for research purposes. Especially the test–retest stability proved to be comparable with those of the German-language source version.

Furthermore, the results of measurement invariance testing suggest cross-nationally scalar measurement invariance of the scale, thereby implying the comparability of latent (co)variances and latent means across the UK and Germany. The non-achievement of uniqueness invariance indicates that the scale reliability of both language versions is not equivalent in both language versions. That is, (co)variances cannot be compared on a manifest level between nations without incurring bias. However, this is not a major problem because it was not an objective of the sale development of SOP2 to achieve equally reliable measures across different language versions. Essential parameters that are usually looked at in culture comparison (e.g., regression coefficients, means) are possible with the level of invariance achieved.

In both language versions, we found uniqueness invariance for gender implying the comparability of manifest scale scores and correlations between gender without incurring bias. With respect to age, we found scalar measurement invariance in both language versions by freely estimating the intercept of the intermediate age group (30–49 years). It is an interesting finding that this age group tended to underestimate their dispositional optimism compared to the younger and older age groups in the UK and to overestimate it more than the other two age groups in Germany. Possible reasons for this could be, for example, that this age group was more prone to social desirability in Germany and less in the UK than the other two age groups, or that they used different frames of reference when assessing their dispositional optimism (see Chen, 2008). Another content-related explanation could be that the intermediate age group is in a phase in which they are settling down and in which important things in life (their own family, home, career, etc.) are given a certain permanence and security, but at the same time they also experience fears of loss and the question of meaning. If one compares the UK and Germany, it could be that the overestimation or underestimation of these two nations is due to different life concepts and mentalities. In Germany, possession orientation may be reflected in the response behavior, whereas in the UK it is something else.

With regard to evidence based on the relationship between scores on SOP2 and on scales measuring other constructs, we could partly support the findings of the original validation of the German-language source version (Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014). For both the UK and Germany, we found that the dispositional optimism scale score correlated most strongly with scores on self-esteem, Emotional Stability, and life satisfaction scales. Thus, individuals with higher self-esteem, Emotional Stability, and life satisfaction had a tendency to have higher levels of dispositional optimism. Our data yielded no notable differences with respect to the directions between the validity coefficients of the German-language source version and the English-language adaptation. With respect to the effect sizes, there was only one discernible difference: In Germany, we found a large negative effect for the association between optimism and external locus of control, but in the UK only a small effect.

Despite the benefits of our study, its scope was limited in three ways. First, our samples were restricted to participants in a web-based survey (CASI). Hence, we cannot generalize our findings to the population as a whole,

including, for example, persons who are not computer literate. However, with slight adaptations to the instructions, oral administration of the instrument in a face-to-face or telephone interview is also conceivable. Second, our validation of the English-language SOP2 was restricted to the population of the UK only. As a consequence, the results are not automatically generalizable to other English-speaking populations, for example, in the USA, although we would not expect differences in the functioning of personality constructs. Third, because of survey time constraints, we could not include lengthy alternative measures of dispositional optimism in our study. However, convergent correlations between SOP2 and a longer measure (LOT-R) have been presented elsewhere (Kemper et al., 2013; Kemper, Beierlein, Kovaleva, & Rammstedt, 2014).

In sum, the results of the present study show for the first time the utility of the English-language adaptation of SOP2 as reliable and valid ultra-short scale, and the comparability of its psychometric properties with those of the German-language source version. Researchers in English-speaking countries now have the possibility of measuring dispositional optimism in an economical and time-efficient way in settings with limited resources as, for example, large scale surveys. In addition, researchers who intend to measure dispositional optimism as part of cross-cultural comparisons can compare latent (co)variances and latent means across the UK and Germany. The scale is recommended for use in self-report surveys in the social sciences and should be applied only for research purposes, not for individual diagnostics.

Abbreviations

ASKU: Allgemeine Selbstwirksamkeit Kurzskala; BFI-2-XS: Extra-short form of the Big Five Inventory–2; BIC: Bayesian information criterion; CASI: Computer-assisted self-administered interviewing; CFA: Confirmatory factor analysis; CFI: Comparative fit index; CI: Confidence interval; DE: Germany; ESS: European Social Survey; FIML: Full information maximum likelihood; GSE-3: General Self-Efficacy Short Scale–3; IE-4: Internal–External Locus of Control Short Scale–4/Internale–Externale-Kontrollüberzeugung–4; KSE-G: Social Desirability–Gamma Short Scale/Kurzskala Soziale Erwünschtheit–Gamma; KUSIV3: Interpersonal Trust Short Scale/Kurzskala Interpersonelles Vertrauen; L-1: General Life Satisfaction Short Scale/Kurzskala zur Erfassung der Allgemeinen Lebenszufriedenheit; LOT-R: Life Orientation Test–Revised; MG-CFA: Multiple-group confirmatory factor analysis; MLR: Robust maximum likelihood; PEKS: Political Efficacy Kurzskala; PESS: Political Efficacy Short Scale; R-1: Risk Proneness Short Scale/Kurzskala zur Erfassung der Risikobereitschaft; RMSEA: Scaled root mean square error of approximation; RSES: Rosenberg Self-Esteem Scale; SOP2: Optimism–Pessimism Short Scale–2/Skala Optimismus–Pessimismus–2; SRMR: Standardized root mean square residual; TRAPD: Translation, Review, Adjudication, Pretesting, and Documentation; UK: United Kingdom

Supplementary Information

The online version contains supplementary material available athttps://doi.org/10.1186/s42409-021-00027-6.

Additional file 1. Answer Sheet (German-Language Version) SOP2

Additional file 2. Answer Sheet (English-Language Version) SOP2

Additional file 3. R Code for Analysis

Additional file 4. Reference Ranges of the SOP2 Scale Scores by Nation for the Total Population and Separately for Gender and Age Groups

Additional file 5. Comparability of SOP2 Across Gender and Age Groups via Measurement Invariance Tests by Nation

Acknowledgements

We would like to thank Melanie Partsch from GESIS–Leibniz Institute for the Social Sciences for supporting us in preparing the data.

Authors' contributions

The authors read and approved the final manuscript.

Funding

The study was funded by an internal grant provided by GESIS – Leibniz Institute for the Social Sciences, Mannheim, Germany. Open Access funding enabled and organized by Projekt DEAL.

Availability of data and materials

The dataset supporting the conclusions of this article is available in the GESIS SowiDataNet | datorium repository, https://doi.org/10.7802/2098.

Declarations

Ethics approval and consent to participate

Participants consented to their participation in an anonymous online survey. Approval by an ethics committee was not necessary.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Received: 20 January 2021 Accepted: 2 October 2021
Published online: 08 January 2022

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