



Measurement invariance of the Satisfaction with Life Scale by gender, age, marital status and educational level

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Abstract

Introduction The Satisfaction with Life Scale (SWLS) has shown strong evidence of acceptability, reliability, validity and invariance for gender, whereas there is mixed evidence of invariance by culture and age and the literature has not explored the roles of marital status and educational level. The SWLS should be invariant by marital status and educational level to be able to compare scores between groups. We aimed to explore the invariance of the SWLS by marital status and educational level.

Method A convenience sample of 726 Spanish adults participated in a survey. We tested a one-factor model using confirmatory factor analysis. We tested the configural, metric and scalar invariance of the factorial structure of the SWLS by gender, age, marital status and level of education.

Results The results show a scalar invariance by gender and educational level and a partial scalar invariance by marital status. Women and individuals in a relationship show greater subjective well-being while no differences are observed among people with different educational levels.

Discussion The SWLS is valid for comparisons between genders, age, educational levels but not for marital status. It is essential to verify its invariance to interpret mean differences and significance values appropriately.

Keywords Invariance · Psychometrics · Gender · Age · Marital status · Educational level

Introduction

The interest in understanding and measuring subjective well-being (SWB) has grown exponentially in the last decades [1]. SWB can be divided into a cognitive (life satisfaction) and an affective component (positive and negative emotions or emotional balance). The cognitive component, life satisfaction, refers to the global cognitive judgement people make about their own lives according to personal criteria [2].

To our knowledge, the scale with the strongest psychometric properties to measure the cognitive component of SWB is the Satisfaction with Life Scale (SWLS) [3]. The SWLS has been adapted and validated in several languages [4]. All these adaptations have shown a one-dimensional structure, which has been confirmed in all studies assessing

its factor structure. However, a recent review showed that the SWLS is being used to compare groups that have not shown strict or scalar invariance [4].

Scales show measurement invariance (MI) when they measure the same construct in different subgroups. Therefore, MI is required before comparing means of such subgroups. There are four levels of invariance, configural, metric, scalar and strict [4]. The current literature overwhelmingly shows that scalar invariance is sufficient to assess comparisons between latent factor means [28, 29]. However, strict invariance is more appropriate for comparisons between observed factor means.

Some studies have also tested the invariance of the SWLS by gender [4]. Most studies have shown strict [5–9] or scalar [10–12] invariance, meaning that comparisons between men and women are appropriate. However, data have not fully supported invariance by age and culture as only one study among Russian and American students showed scalar invariance [13] and an Angolan study found strict invariance for six different age groups [9].

While most studies have focused their invariance testing on age, gender and culture, other studies have focused

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on differences in SWB measured with the SWLS by marital status [14, 15] but their data have not supported scalar invariance. However, studies using other measures of SWB have tested and showed invariance by marital status [27]. These studies showed that having a stable partner or being married predicts high levels of SWB possibly due to feelings of loneliness. However, no study has explored the invariance of the SWLS by marital status.

Educational level is also a good predictor of high levels of SWB [16] and there is a need to show stronger evidence of its role in the SWLS's invariance as only Bai et al. [5] observed metric invariance across Chinese adults of four educational levels. For this reason, the goal of this paper is to explore configural, metric and scalar invariance of the SWLS by marital status and educational level. We also report additional evidence of gender and age invariance in a large Spanish sample.

Method

Participants

A convenience sample of 726 Spanish adults 18–71 years, ($M = 29.36$; $SD = 12.37$) participated in an online survey. Part of the sample included students of the Faculty of Psychology of the University of Valencia (52.2%), who responded to the survey using their computers in the classroom. The rest of participants were recruited through mailing lists or social networks of the authors, as well as personal contacts via a survey link sent by email. All participants were asked about their nationality and this study only included those whose nationality was Spanish. To participate, all individuals had to read the first page of the online survey which summarized the project and emphasized their right to withhold participation in any part of the project and the anonymity of the data. Only individuals who clicked on the “agree to participate” option had access to the rest of the survey and were considered participants. Participation was voluntary, and participants had the option to delete their answers and leave the survey at all times. Demographic characteristics are shown in Table 1.

Measures

The Satisfaction with Life Scale (SWLS) is a five-item instrument designed to measure global cognitive judgment of satisfaction with one's own life [2, 3]. Participants indicated how much they agreed or disagreed with each item using a seven-point Likert scale ranging from one (strongly disagree) to seven (strongly agree). Scores range from 7 to 35, higher scores indicating higher life satisfaction.

Table 1 Sociodemographic characteristics of the sample

	<i>n</i>	%
Gender		
Male	325	44.8
Female	401	55.2
Age		
24 or younger	375	51.7
Older than 24	351	48.3
Marital status		
Single	458	64.5
In a relationship ^a	258	35.5
Educational level		
High school or lower	399	55.0
Higher than high school	327	45.0

^aMarried, common-law and in a romantic relationship with another person

Regarding sociodemographic variables, educational level was obtained by asking about the highest level of education completed, with answers being primary studies (6–12 years), compulsory secondary studies (13–16 years), high school (non-compulsory, 17–18 years) and college studies or above. This variable was later categorized as high school or lower versus higher than high school. Marital status was categorized into single (never married, widowed, separated, divorced persons) versus in a relationship (married, common-law and in a romantic relationship with another person). Questions also asked whether participants were male or female and their age, which was later categorized as 24 years old or younger and older than 24 years old. The age groups were categorized with a cutoff of 24 given the high number of undergraduate students aged 24 and younger and the fact that splitting those 25–71 into subgroups was not feasible as the sample size would have been too small to test invariance.

Data analysis

We tested the one-factor structure widely supported in the literature [4] and conducted confirmatory factor analysis (CFA) using Mplus 8.1 [17]. We used maximum likelihood robust (MLR) to estimate model parameters and statistics for two reasons. First, most invariance studies using the SWLS treated data as continuous [4] and second, MLR is considered the best estimator with missing data and with Likert scales of more than five points [30]. We calculated Chi square (χ^2), comparative fit Index (CFI), Tucker–Lewis index (TLI) and root mean square error of approximation (RMSEA) to evaluate the goodness of fit of the proposed models. Cut-offs for goodness of fit were 0.90 for CFI/TLI

and 0.08 for RMSEA indicating acceptable fit and 0.95 for CFI/TLI and 0.06 for RMSEA indicating excellent fit [18].

We assessed invariance of the factorial structure of the SWLS by gender, marital status and educational level. Three nested models with increasing degrees of restriction were tested: the base model assessed configural invariance and allowed free estimation of all the parameters for each group. The metric (weak) invariance model, nested in the configural model, added the restriction of invariant factor loadings among groups. Finally, the scalar (strong) invariance model, nested in the second model, added the intercept constraint of the invariant items among the comparison groups. Given that the Chi-square indices are sensitive to the sample size, we focused mainly on the comparison of the CFI, TLI and RMSEA indices. We considered a variation of these indices higher than .01 as a criterion to rule out the invariance of the more restrictive model and accept the more parsimonious model [19]. We also assessed composite reliability of the scale using Raykov's coefficient. We considered values to be acceptable if they reached 0.70 [20].

Results

Table 2 shows the descriptive data of the SWLS for the complete sample and for each of the groups in which the invariance was measured. Composite reliability (Raykov's coefficient) was good (.869). The one-dimensional model for the total sample presented an excellent fit $\chi^2 = 14.610$ (5 df), CFI = .991; TLI = .982; RMSEA = .052.

Table 3 shows the goodness-of-fit indices of the multidimensional model by gender, age, marital status and educational level and nested models of invariance, in ascending order of restriction level. Results show that the SWLS had strong invariance by gender, and the fit of the one-dimensional model for male and female was excellent. These results mean that the latent means can be compared by gender. The latent mean values were fixed to zero for males and women had a greater satisfaction than men ($b = .152$, $z = 2.028$, $p < .05$).

The model showed acceptable fit for both age groups, meaning that the latent means of both groups can be compared because the SWLS presented strong invariance by age. The latent mean values were fixed to zero for individuals 24 and younger. In this case, there were no significant differences in satisfaction with life by age ($b = -.002$, $z = -.024$, $p = .981$).

The model showed acceptable fit for both marital status groups. However, in this case, invariance was not included in the most restrictive model (scalar). Partial scalar invariance was calculated by keeping item 2 invariant ("The conditions of my life are excellent"). Assuming this partial invariance, both groups can be compared by marital status and those in a relationship were more satisfied with their life than single individuals ($b = .191$; $z = 2.486$; $p < .05$), but item 2 has been fixed to 0 in both groups.

The model fitted excellently for participants with high school or lower educational level and acceptably for those with an educational level higher than high school, meaning that the latent means of both groups can be compared because the SWLS presented strong invariance by

Table 2 Items' means and standard deviations, for the total sample and all subgroups

	I1		I2		I3		I4		I5	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total sample	3.66	1.11	3.81	1.07	3.91	1.01	3.27	1.22	4.07	.954
Gender										
Male	3.56	1.12	3.67	1.11	3.85	1.02	3.20	1.26	4.09	.911
Female	3.75	1.09	3.92	1.03	3.95	1.00	3.33	1.19	4.06	.988
Age										
24 or younger	3.65	1.14	3.77	1.22	3.90	1.26	3.37	1.50	4.06	.982
Older than 24	3.67	1.27	3.85	1.07	3.91	1.00	3.16	1.47	4.08	.831
Marital status										
Single	3.59	1.19	3.66	1.11	3.84	1.04	3.23	1.25	4.05	.966
In a relationship	3.80	1.07	4.09	.940	4.03	.927	3.35	1.18	4.11	.933
Educational level										
High school or lower	3.65	1.09	3.71	1.10	3.91	1.01	3.26	1.21	4.02	.987
Higher than high school	3.68	1.12	3.93	1.03	3.90	1.00	3.28	1.24	4.13	.910

Item (1) In most ways my life is close to my ideal; Item (2) The conditions of my life are excellent; Item (3) I am satisfied with my life; Item (4) So far I have gotten the important things I want in life; Item (5) If I could live my life over, I would change almost nothing

SD Standard deviation

Table 3 Tested models and goodness-of-fit indices

	χ^2	<i>df</i>	$\Delta\chi^2$	Δdf	CFI	TLI	RMSEA	ΔCFI	ΔTLI	$\Delta RMSEA$
Models in each group										
Gender										
Female	10.939*	5			.993	.986	.055			
Male	8.287*	5			.995	.990	.046			
Age										
24 or younger	16.657*	5			.979	.958	.079			
Older than 24	2.037	5			.00	1.01	.000			
Marital status (partial scalar)										
Single	19.008*	5			.986	.971	.078			
In a relationship	11.612*	5			.990	.979	.074			
Educational level										
High school or lower	14.117*	5			.999	.998	.067			
Higher than high school	13.695*	5			.989	.977	.075			
Global models										
Gender										
Configural	19.226*	10	–	–	.994	.988	.051	–	–	–
Metric	24.529*	14	5.302	4	.993	.990	.046	–.001	.002	–.005
Scalar	38.716*	18	14.187	4	.987	.985	.057	–.006	–.005	.009
Age										
Configural	23.909*	10	–	–	.992	.983	.063	–	–	–
Metric	26.742*	14	2.833	4	.992	.989	.051	.000	.006	–.012
Scalar	39.091*	18	12.350	4	.987	.986	.057	–.005	–.003	.006
Marital status										
Configural	30.620*	10	–	–	.987	.974	.077	–	–	–
Metric	34.304*	14	3.683	4	.987	.982	.064	.000	.008	.013
Scalar	58.117*	18	23.813	4	.975	.972	.080	–.012	–.010	–.016
Partial scalar	36.164*	17	1.860	3	.988	.986	.057	.001	.004	.007
Educational level										
Configural	28.076*	10	–	–	.989	.977	.072	–	–	–
Metric	31.849*	14	3.772	4	.989	.984	.060	.000	.007	–.012
Scalar	47.429*	18	15.580	4	.982	.979	.068	–.007	–.005	.008

df degrees of freedom, χ^2 Chi square, $\Delta\chi^2$ difference in Chi square, Δdf difference in degrees of freedom, *CFI* comparative fit index, *TLI* Tucker–Lewis index, *RMSEA* root mean square error of approximation, ΔCFI difference in comparative fit index, ΔTLI difference in Tucker–Lewis index, $\Delta RMSEA$ difference in root mean square error of approximation

*All of χ^2 are $p < .001$

educational level. The latent mean values were fixed to zero for individuals with high school education or lower. In this case, there were no significant differences in satisfaction with life by educational level ($b = .053$, $z = .710$, $p = .478$).

Discussion

Satisfaction with life is a cognitive component of subjective well-being and it has been measured frequently with the SWLS. For this reason, it is important to test this measure's invariance among people of different groups before pointing out differences between those groups. This study provides for the first time evidence of the SWLS invariance

in a sample of Spanish adults, based on educational level and marital status.

In this sample, the SWLS showed scalar invariance across genders, which is in line with previous studies [10–12]. Women showed higher life satisfaction than men in our sample [4]. Even though in some studies [21–23] item 2 has not been invariant for both genders, our results suggest that interpretations and the meaning of the SWLS may generally be considered as equivalent across genders.

Regarding the two age groups in our sample, the SWLS presented strong invariance by age and there were no significant differences in satisfaction with life by age group. Our study is the first to show scalar invariance by two groups of age: 24 or younger and older than 24. These two groups

were used as a reference of life change in previous SWLS invariance studies [6, 9, 10, 24]. In a previous study [9], the youngest group (14–17 years old) showed higher levels of SWB but latent means remained almost unchanged from 25 to 65 years old, in line with our findings.

The two new variables considered in this study have been marital status and educational level. In this case, the SWLS shows strong invariance between people with higher than high school education and those with a lower educational level, presenting in this sample similar values of satisfaction with their lives, in line with results obtained in previous studies [15, 25].

Regarding marital status, the SWLS did not show strong invariance due to item 2. This item has also led to a lack of gender invariance in other studies [4]. We recommend that this item is not taken into account when comparing well-being by marital status. The calculation of partial scalar invariance allows us to compare the means of both groups and the results show that individuals in a relationship have higher levels of life satisfaction, like previous studies suggest [26].

This study has some limitations. The sample is not representative of the Spanish population, since it used non-probabilistic sampling. In addition, future studies should examine the invariance of other scales of well-being, such as the Flourishing Scale, and compare results. Future research is also needed to compare across finer groups of age, education or marital status beyond binary groupings. These comparisons will require a much larger sample size.

The SWLS is still one of the most widely used scales and it is essential to assess its invariance among different groups to interpret mean differences and significance values appropriately. Invariance verification by educational level and marital status shows that comparing latent means between these groups is appropriate, although item 2 should not be taken into account when comparing by marital status.

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Compliance with ethical standards

Conflict of interest The authors of this manuscript certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Ethical approval Study procedures were determined by the University of València data control technician (and current director of the Chair of Privacy and Digital Transformation Microsoft-UV) as constituting non-identifiable, minimum risk survey research, in a private document signed electronically dated March 20th, 2015. Because it was an anony-

mous survey study, approval by the ethical committee is not necessary, according to Spanish legislation.

Informed consent Informed consent was obtained from all individual participants included in the study.

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