

Validation of the Mental Health Continuum-Short Form (MHC-SF) for Multidimensional Assessment of Subjective Well-Being in Spanish Adolescents

José A. Piqueras¹, Verónica Vidal-Arenas², Raquel Falcó¹, Beatriz Moreno-Amador¹, Juan C. Marzo¹, and Corey L. M. Keyes³

¹ Universidad Miguel Hernández de Elche, ² Universitat Jaume I, and ³ Emory University, Atlanta (USA)

Abstract

Background: The Mental Health Continuum-Short Form (MHC-SF) is a multidimensional instrument designed to capture emotional, psychological, and social well-being. It is one of the self-report measures of international use in clinical practice and research, although so far it has no validation in Spanish-speaking adolescents. Therefore, the objective of this study was to analyze the reliability and validity evidence (structure, convergent and criterion), and the temporal and gender invariance of the MHC-SF in Spanish adolescent population. **Method:** Two assessment moments with a 6-month time interval were used, with an initial sample of 5,479 adolescents and a later sample of 2,129. **Results:** The CFA showed optimal fit for the bi-factor model, and an adequate fit for correlated three-factor model. The results of the gender and temporal invariance analysis showed optimal fit. Reliability coefficients were all higher than .77. The MHC-SF presented significant positive associations ($p < .001$) with indicators of well-being ($r > .60$) and negative associations with indicators of psychological distress ($r > -.21$). **Conclusions:** The MHC-SF shows evidence of reliability and validity in Spanish adolescents, being the bi-factor model invariant through time and across gender groups.

Keywords: mental health, subjective well-being, adolescents, self-report, Mental Health Continuum-Short Form (MHC-SF).

Resumen

Validación de la Versión Abreviada del Mental Health Continuum (MHC-SF) para la Evaluación Multidimensional del Bienestar Subjetivo en Adolescentes Españoles. Antecedentes: el Continuo de Salud Mental-Versión Abreviada del Mental Health Continuum (MHC-SF) es un instrumento multidimensional que evalúa el bienestar emocional, psicológico y social. Es una de las medidas de autoinforme más utilizadas a nivel internacional en clínica e investigación, aunque hasta el momento no dispone de validación en adolescentes hispanohablantes. El objetivo de este estudio fue analizar la fiabilidad y la evidencia de validez (estructural, convergente y de criterio), así como la invarianza temporal y de género del MHC-SF en población adolescente española. **Método:** se utilizaron dos momentos de evaluación con un intervalo temporal de 6 meses, con una muestra inicial de 5.479 adolescentes y una muestra posterior de 2.129. **Resultados:** los CFA mostraron un ajuste óptimo para el modelo bifactorial y adecuado para el modelo de factores correlacionados. Los resultados del análisis de invarianza de género y temporal mostraron un buen ajuste. Se observaron coeficientes de consistencia interna superiores a .77. El MHC-SF presentó asociaciones positivas significativas ($p < .001$) con los indicadores de bienestar ($r > .60$) y negativas con los de malestar psicológico ($r > -.21$). **Conclusiones:** el MHC-SF muestra evidencias de fiabilidad y validez en adolescentes españoles, siendo el modelo bifactorial invariante en el tiempo y entre grupos de género.

Palabras clave: salud mental, bienestar subjetivo, adolescentes, autoinforme, Continuo de Salud Mental-Versión Abreviada del Continuo de Salud Mental (MHC-SF).

Mental health has been identified as a key public health concern, particularly for children and adolescents (World Health Organization, 2014). Broad international reviews on estimates the prevalence of mental health problems among adolescents have reported overall prevalence rates of 13.4% (Polanczyk et al., 2015). Moreover, the COVID-19 pandemic has provoked a considerable

increase in mental health problems among children and adolescents (Tamarit et al., 2020). In addition, the presence of psychological problems at a subclinical level has been recently reported, with 7.7% of adolescents at risk for mental health difficulties (Fonseca-Pedrero et al., 2020). Fortunately, there is considerable empirical evidence on the efficacy of psychotherapeutic interventions for different mental disorders among children and adolescents (see, for more details, Fonseca-Pedrero et al., 2021). However, as supported by many relevant organizations and authors in the field over the past 70 years, mental health is not merely the absence of mental problems but the presence of sufficiently high levels of well-being (Ryff & Keyes, 1995) or, at least, a complete state of mental health should integrate the combination of the absence of

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Corresponding author: José A. Piqueras
Department of Health Psychology
Universidad Miguel Hernández de Elche
03202 Elche (Spain)
e-mail: jpiqueras@umh.es

mental illness and a strong sense of well-being. Consequently, an entire state of mental health is better defined from a comprehensive dual-factor or Bidimensional Mental Health Model (BMHM; e.g., Greenspoon & Saklofske, 2001).

There are at least two main instruments from this integrative approach that stand out from the others in terms of their impact on science and among professionals, the Warwick-Edinburgh Mental Well-Being Scale (WEMWBS; Tennant et al., 2007) and the instrument specifically derived by Keyes to measure well-being comprehensively, the Mental Health Continuum-Long Form (MHC-LF; Keyes, 2002), and Short Form (MHC-SF; Keyes et al., 2008). The MHC-LF consists of 40 items, whereas the short version has 14 items. Both of them present a multidimensional structure, capturing emotional, psychological, and social well-being, and have been supported for use in people over 12 years of age.

According to Keyes' model of mental health and well-being (2002), emotional well-being implies the presence of positive affect or the balance between (positive and negative) feelings experienced in life (hedonic well-being, in terms of subjective happiness, interest in life, and satisfaction with life). Psychological well-being reflects the eudaimonic tradition, which implies positive individual functioning, in terms of self-acceptance, positive relationships with others, personal growth, purpose in life, mastery of the environment, and autonomy. Lastly, social well-being refers to positive social functioning and communitarian life, which implies individuals' perception of the quality of their relationships with others, feeling a part of society and socially accepted, and that one has something to contribute, among others.

The MHC-SF has received international psychometric support for use with adults, youth, and adolescents and is available in more than 38 different languages (i.e., Longo et al., 2020; Santini et al., 2020; Żemojtel-Piotrowska et al., 2018).

Regarding the studies using adolescent samples, at least three have reported support for the full invariance of the three-factor solution across gender and age (Carvalho et al., 2016; Guo et al., 2015; Luijten et al., 2019), and another study has reported the invariance across gender of the bifactor model of MHC-SF (Reinhardt et al., 2020).

Concerning reliability, the MHC-SF has shown excellent internal consistency in adolescents (ages 12-18) in Asian countries (Guo et al., 2015; Lim, 2014), Portuguese children and adolescents (7-16) (Carvalho et al., 2016; Matos et al., 2010), Dutch adolescents (11-18) (Kennes et al., 2020; Luijten et al., 2019), Hungarian adolescents (11-20) (Reinhardt et al., 2020), and U.S. adolescents (12-18) (Keyes, 2006a, 2006b, 2009). In Spain, several studies specifically support its reliability for adolescents: consistency .89 for general well-being, .72 for emotional/hedonistic well-being, and .87 for eudaimonic well-being (.77 for psychological well-being and .81 for social well-being) (i.e., Piqueras et al., 2019).

Research comparing the levels of well-being dimensions across gender has also generally shown the absence of gender differences or only minor differences (Joshani & Jovanović, 2017; Peña-Contreras et al., 2017; Petrillo et al., 2015). However, research on gender differences in well-being conducted in several countries has not produced conclusive results (Matud et al., 2021).

So far, no studies have supported an in-depth analysis of the psychometric properties of the MHC-SF with a Spanish-speaking adolescent population. Therefore, this study aims to provide psychometric data on the reliability and validity of the MHC-SF in a sample of Spanish adolescents, following the recommendations

of Muñiz and Fonsenca-Pedrero (2019). Specifically, our aims were: (1) to confirm the structural validity and reliability of the two competing models described in the literature (i.e., three-correlated factors and the bi-factor structure), (2) to analyze the structural invariance of both models across gender and time, (3) to analyze convergent/criterion validity with different psychological measures, (4) to provide normative data for the MHC-SF among Spanish adolescents. We expected to find support for the two competing models in the study sample (in favor of the three-factor model: Carvalho et al., 2016; Guo et al., 2015; Kennes et al., 2020; Keyes, 2006a, 2006b, 2009; Lim, 2014; Luijten et al., 2019; Matos et al., 2010; and Peña-Contreras et al., 2017; in favor of the bi-factor model: Echeverría et al., 2017; Longo et al., 2020; and Reinhardt et al., 2020), and we also expected to observe structural invariance across gender (Carvalho et al., 2016; Guo et al., 2015; Luijten et al., 2019) and over time. Finally, we expected to find significant and positive relations with convergent measures (i.e., indicators of well-being such as socio-emotional skills and health-related quality of life) and significant and negative associations with criterion measures (i.e., indicators of psychological distress such as general distress and internalizing and externalizing symptoms, and attention deficit hyperactivity).

Method

Participants

Adolescents aged from 12 to 18 participated in a longitudinal project. Two waves of data were collected with a six-month interval [T0, $n = 5,479$ adolescents, $M_{age} = 14.18$ years ($SD = 1.51$), 50.7% female; T1, $n = 2,129$, $M_{age} = 13.98$ years ($SD = 1.39$), 52.70% female]. Participants completed the MHC-SF and other psychological measures. They were enrolled in Spanish secondary education grades equivalent to U.S. middle and high school from 7th (age 12-13) to 12th grade (age 17-18).

Instruments

Mental Health Continuum-Short Form (MHC-SF; Keyes et al., 2008). This measure provides self-reported well-being scores, divided into 3 sub-factors: Psychological (6 items) (PWB), Emotional (3 items) (EWB), and Social well-being (5 items) (SWB). Each item has six response options of the frequency of subjective well-being symptoms in the last month, ranging from 1 (*never*) to 6 (*always*). The Spanish version of MHC-SF was adapted to the Spanish language following the guidelines of the International Test Commission (Muñiz et al., 2013), using an iterative-translation method that began with several independent translations. The item translations were then reviewed by a committee of translators with knowledge of the Spanish language and culture and specialists in the field of assessment in children and adolescents, who analyzed the adequacy of the adapted version. Interviews concerning the comprehension of the items were performed to ensure that all items were understood by the adolescents. We also maintained direct contact with Dr. Keyes (one of the creators of MHC-SF) and Dr. Olivos-Jara (responsible for the translation and adaptation of MHC-SF for adults in Spain) during this process to achieve an adequate cross-cultural adaptation to the European Spanish language of MHC-SF for adolescents. The adaptation of the MHC-SF to Spanish can be seen in Table 1.

Table 1
Adaptation of the Mental Health Continuum – Short Form (MHC-SF) [versión abreviada del Mental Health Continuum]
(Keyes, Wissing, Potgieter, Temane, Kruger, & van Rooy, 2008)

Please answer the following questions are about how you have been feeling during the past month. Place a check-mark in the box that best represents how often you have experienced or felt the following:

During the past month, how often did you feel... [Con qué frecuencia, durante el último mes, yo he sentido...]	Never [Nunca]	Once or twice [Casi Nunca]	About once a week [Pocas veces]	2 or 3 times a week [Muchas veces]	Almost every day [Casi siempre]	Avery day [Siempre]
1. happy [alegría]	1	2	3	4	5	6
2. interested in life [interés por la vida]	1	2	3	4	5	6
3. satisfied with life [satisfacción con la vida]	1	2	3	4	5	6
4. that you had something important to contribute to society [que tengo algo importante que aportar a la sociedad]	1	2	3	4	5	6
5. that you belonged to a community (like a social group, your school, or your neighborhood) [que me siento parte de una comunidad/grupo social]	1	2	3	4	5	6
6. that our society is a good place, or is becoming a better place, for all people [que nuestra sociedad es un buen lugar o se está transformando en un sitio mejor para todo el mundo]*	1	2	3	4	5	6
7. that people are basically good [que las personas son generalmente buenas]	1	2	3	4	5	6
8. that the way our society works made sense to you [que el funcionamiento de la sociedad tiene sentido para mí]	1	2	3	4	5	6
9. that you liked most parts of your personality [que me gusta gran parte de mi personalidad]	1	2	3	4	5	6
10. good at managing the responsibilities of your daily life [que he cumplido con mis responsabilidades diarias]	1	2	3	4	5	6
11. that you had warm and trusting relationships with others [que mis relaciones con las demás personas han sido cercanas y de confianza]	1	2	3	4	5	6
12. that you had experiences that challenged you to grow and become a better person [que he tenido experiencias que me han hecho crecer y llegar a ser mejor persona]	1	2	3	4	5	6
13. confident to think or express your own ideas and opinions [confianza al pensar o expresar mis propias ideas y opiniones]	1	2	3	4	5	6
14. that your life has a sense of direction or meaning to it [que mi vida tiene sentido (merece la pena)]	1	2	3	4	5	6

* Note: The original wording for Item 6 was “that our society is becoming a better place for people like you [que nuestra sociedad es un buen lugar o se está transformando en un sitio mejor para personas como tú]”. This item does not work in all cultural contexts. However, when validating the MHC-SF, test both versions of item 6 to see which one works best in your context

Youth-Pediatric Symptom Checklist-17 (Y-PSC-17; Jellinek et al., 1999). This short self-report screening measure is widely used by pediatricians and other mental health professionals to identify psychosocial problems in children and adolescents and evaluate treatment outcomes. The Y-PSC-17 presents three subscales to assess three types of problems: internalizing symptoms (i.e., depression and anxiety), externalizing symptoms (i.e., disruptive behavior), and attention deficit hyperactivity (ADH). The subscales contain 17 items that are rated as “Never” (0), “Sometimes” (1), or “Often” (2) present. The Y-PSC-17 has received support for pediatric practice by three works (Bergmann et al., 2020; Gardner et al., 1999; Parker et al., 2019). The Spanish validation study was recently published, showing adequate evidence of reliability and validity (Piqueras, Vidal-Arenas et al., 2021).

Social-Emotional Health Survey-Secondary (SEHS-S; Furlong et al., 2014). This instrument was developed to measure the level of socio-emotional competence through the components of the Covitality latent construct among youth. The Social-Emotional Health Survey (SEHS) has three versions: primary, secondary, and higher education. We used the Spanish version of the Social-Emotional Health Survey-Secondary (SEHS-S; Piqueras et al., 2019).

The SEHS-S presents 36 items, that are rated on a four-point scale ranging from 1 (*not at all true*) to 4 (*very much true*). The instrument assesses core psychosocial traits based on a higher-order model comprising 12 first-order traits, grouped into 4 second-order latent domains (each one with 3 subscales), and 1 general higher-order factor (Covitality). The first domain, called Belief-in-Self, measures Self-Efficacy, Self-Awareness, and Persistence. The domain Belief-in-Others comprises School Support, Peer Support, and Family Support. The domain Emotional Competence includes Emotion Regulation, Empathy, and Behavioral Self-Control. Engaged Living, the last domain, measures Gratitude, Zest, and Optimism.

Social-Emotional Distress Survey-Secondary (SEDS-S; Dowdy et al., 2018). The Social-Emotional Distress Survey-Secondary (SEDS-S) is a 10-item behavioral screening questionnaire designed to measure internalizing distress using a four-point scale ranging from 1 (*not at all true*) to 4 (*very much true*). In their study, Dowdy et al. (2018) found significant positive relationships of the SEDS-S distress factor with symptoms of anxiety and depression and also significant negative associations with life satisfaction and strengths scores. The validation of this measure is under process by our team.

KIDSCREEN-10 Index (Ravens-Sieberer et al., 2010). This unidimensional scale measures health-related quality of life (HRQoL) both in healthy and chronically ill children and adolescents. It was developed to identify children at risk, specifically in terms of subjective health, and indicates appropriate early interventions. The instrument provides an overall HRQoL index covering the physical, psychological and social facets of HRQoL through a five-point response scale ranging from 1 (*not at all*) to 5 (*very extremely*). Reliability indices (Cronbach's alpha) reached .82, and test-retest reliability at two weeks reached .55 in 13 European participant countries, which included Spain (Ravens-Sieberer et al., 2010). Reliability coefficients for this sample are shown in Table 7.

Procedure

The study was approved by the Universidad Miguel Hernández (UMH) Project Evaluation Committee with reference number DPS.JPR.02.17. Once the project was approved, a quota sampling was carried out in two areas of southeastern Spain: the province of Alicante (PA) belonging to the Valencian Community, and the Autonomous Community of Region of Murcia (RM). A random selection of secondary schools was performed based on ownership (public/non-public schools; secular/Catholic schools) and regional geographical areas (9 areas in PA and 21 in RM). After the directors of 100 centers had been contacted, 13 from PA and 21 from RM accepted to participate: 34 secondary schools (65.2/34.8% of public/non-public and 87/13% of secular/Catholic schools of the total number of centers). The quota sampling method and the large sample recruited ensured the representativeness of our sample concerning the universe population of adolescents aged 12-18 years in the regions where the study was conducted.

After the directors of the schools had accepted, informed consent in writing was delivered to the adolescents and their parents/legal guardians, requesting them to sign it to participate in the research. The data collection for the two assessment waves (T0 and T1) was carried out in the schools and supervised by the research staff in person. The self-reporting assessment protocol was applied individually through the online survey tool LimeSurvey ©. The completion of the protocol took around 15-20 minutes on average. Participation was voluntary, and the adolescents did not receive any incentive for their collaboration but the schools received a feedback report including the results by class group and an individual warning if any risk for suicide was found.

Data Analyses

All analyses were conducted with SPSS 25 and Mplus 8.4. First, we examined item distribution and frequency. Previously, the analysis of outliers was carried out by graphically representing the results (box diagrams). Although outliers were detected, we decided not to remove them from analyses because these outliers were considered as valid cases of population.

Next, confirmatory factor analyses (CFA) were conducted to determine how well the data fit the candidate models previously tested in other countries (Longo et al., 2020): the three-factor solution and the bi-factor model. We used a maximum likelihood estimation with robust standard errors (MLR) and handled missing data with Mplus 8.4. Finally, we tested model goodness-of-fit using the comparative fit index (CFI), the Tucker-Lewis index (TLI), and

the root mean square error of approximation (RMSEA). Values of CFI and TLI $> .90$ and $> .95$ indicate an acceptable and optimal fit, respectively, and RMSEA values $\leq .06$ indicate optimal fit (Marsh et al., 2004).

Then we tested whether the MHC-SF presents invariant structure across gender and over time (i.e., multi-group and longitudinal measurement invariance; Byrne et al., 1989; Byrne & Watkins, 2003). In particular, three levels of measurement invariance were tested: (1) *configural* (testing whether all items load on the proposed factor), (2) *metric* (testing whether item-factor loadings are similar across groups), and (3) *scalar* (testing whether the unstandardized item thresholds are similar across groups). Thus, to indicate a significant decrement in fit when testing for measurement invariance, we used the model comparison criteria of $\Delta\text{CFI}/\Delta\text{TFI} \geq 0.01$ (i.e., decrease indicates a worse fit; Cheung & Rensvold, 2002) and $\Delta\text{RMSEA} \geq 0.015$ (i.e., increase indicates a worse fit; Chen, 2007).

When there is scalar measurement invariance, the comparison of factor means across groups is allowed (Dimitrov, 2012). Consequently, we calculated gender differences. We estimated Cohen's *d* index (standardized mean difference), which evaluates the effect size of the obtained differences (Cohen, 1988). We also calculated the Cronbach alpha (Cronbach, 1951) and ordinal omega coefficients (McDonald, 1999) to test the reliability of the scores using SPSS v.25 and Mplus 8.4, respectively. Convergent and criterion validity were evaluated by Pearson correlation coefficients between the scores on the MHC-SF and different well-established measures of distress (i.e., SEDS-S, Y-PSC-17) and well-being (i.e., SEHS-S, KIDSCREEN-10 Index). Here also, Cohen's criteria were used to estimate the magnitude of the associations (Cohen, 1988). Finally, normative data for MHC-SF were estimated in the form of percentiles.

Results

Descriptive statistics of items and expected factors

Means, standard deviations, skewness, kurtosis of items and corrected item-total correlations can be seen in Table 2. Descriptive statistics of the MHC-SF dimensions can be seen in Table 3.

Structural Validity

As shown in Table 4, the results of the CFA showed an adequate or optimal fit of the MHC-SF to a three-factor structure. The visual representation of the original three-factor model can be seen in Figure 1. Longitudinal measurement invariance was found for the three-factor solution and also across gender. As depicted in Table 5, the results of the CFA showed an even better fit of the MHC-SF to a bi-factor structure in comparison with the three-factor model. The visual representation of the bi-factor solution can be seen in Figure 2. Longitudinal invariance was found for the three-factor solution and also across gender, with better indices in all cases. Standardized factor loadings are provided in Table 6.

Reliability Evidence and Descriptive Statistics

As can be seen in Table 7, the Cronbach alpha and omega coefficient values for all measures were higher than .65 and especially high for the General Well-Being score (males = .92,

females = .93). Regarding gender differences, as expected, males obtained significantly higher well-being scores, with a small effect size ($d = 0.08 - 0.15$). Concerning distress indices, females

obtained higher scores on general distress and internalizing problems than males, with a small-to-medium effect size ($d = 0.35$ and 0.42 , respectively). The differences in the subscales of

Table 2
Descriptive Statistics of Items of the Mental Health Continuum-Short Form

	Mean (SD)	Skewness	Kurtosis	Corrected Item Correlations			
				Emotional WB	Social WB	Psychological WB	Global WB score
Item 1	4.36 (1.75)	-.934	.553	.470			.462
Item 2	4.96 (1.51)	-1.003	.290	.710			.729
Item 3	4.76 (1.58)	-.811	-.027	.719			.755
Item 4	3.78 (2.18)	-.178	-.746		.562		.594
Item 5	4.46 (2.27)	-.721	-.425		.625		.641
Item 6	3.78 (2.33)	-.147	-.922		.710		.662
Item 7	4.02 (1.40)	-.234	-.287		.599		.623
Item 8	3.95 (2.01)	-.236	-.689		.726		.711
Item 9	4.80 (1.46)	-.907	.342			.686	.681
Item 10	4.49 (1.38)	-.525	-.217			.587	.577
Item 11	4.81 (1.38)	-.879	.347			.643	.647
Item 12	4.53 (1.59)	-.593	.196			.617	.605
Item 13	4.57 (1.63)	.631	-.261			.694	.669
Item 14	5.03 (1.67)	-1.244	.749			.685	.743

Note: WB = Well-being

Table 3
Descriptive Statistics of the Dimensions of the Mental Health Continuum-Short Form

	Mean (SD)	Skewness	Kurtosis	Inter-Item Correlation Indices
Emotional WB	14.07 (3.19)	-.767	.148	.556
Social WB	19.98 (5.56)	-.252	-.499	.512
Psychological WB	28.25 (5.67)	-.781	.486	.507
Global WB score	62.30 (12.93)	-.573	.028	.460

Note: WB = Well-being

Table 4
Goodness-of-fit for the Three-Factor Structure (CFA Model) and Fit Indices of the Measurement Invariance Models of the Mental Health Continuum-Short Form

	Overall Fit Indices					Comparative Fit Indices			
	χ^2	df	CFI	TLI	RMSEA [90% CI]	Model comparison	Δ CFI	Δ TLI	Δ RMSEA
<i>Baseline model</i>									
Three-factor structure	1814.015***	74	.940	.926	.065 [.062,.068]	–	–	–	–
<i>Longitudinal invariance</i>									
1. Configural	4295.388***	335	.918	.907	.046 [.044,.047]				
2. Metric	4358.273***	346	.917	.909	.045 [.044,.046]	1 vs. 2	.001	-.002	.001
3. Scalar	4589.097***	360	.912	.908	.045 [.044,.047]	2 vs. 3	.005	.001	.000
<i>Multi-group invariance across gender</i>									
1. Configural	1.904.477***	148	.939	.925	.065 [.063,.068]				
2. Metric	1.956.422***	159	.938	.929	.064 [.061,.066]	1 vs. 2	.001	-.004	.001
3. Scalar	2.083.212***	170	.934	.929	.064 [.061,.066]	2 vs. 3	.004	.001	.001

Note: df = degree of freedom; CI = Confidence Intervals
*** $p < .001$

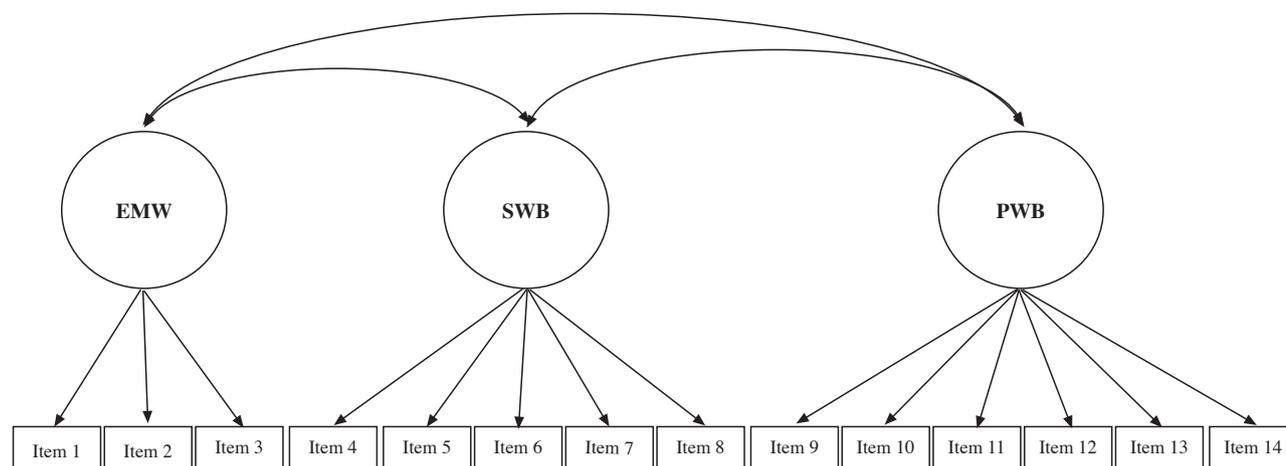


Figure 1. Tested model of MHC-SF structure: correlated-three factor model. Note: SWB = Social Well-being; EWB = Emotional Well-Being; PWB = Psychological Well-Being

Table 5
Goodness-of-fit for the Bi-Factor Structure (CFA Model) and Fit Indices of Measurement Invariance Models of the Mental Health Continuum-Short Form

	Overall Fit Indices					Comparative Fit Indices			
	χ^2	df	CFI	TLI	RMSEA [90% CI]	Model comparison	Δ CFI	Δ TLI	Δ RMSEA
<i>Baseline model</i>									
	1197.904***	63	.960	.942	.057 [.055, .060]	-	-	-	-
<i>Longitudinal invariance</i>									
1. Configural	2010.570***	292	.963	.952	.033 [.031, .034]				
2. Metric	2058.878***	320	.963	.956	.031 [.030, .033]	1 vs 2	.001	.004	-.002
3. Scalar	2325.124***	334	.957	.952	.033 [.032, .034]	2 vs 3	-.006	-.004	.002
<i>Multi-group invariance across gender groups</i>									
1. Configural	2359.082***	584	.962	.951	.033 [.032, .035]				
2. Metric	2425.825***	632	.962	.954	.032 [.031, .034]	1 vs 2	.001	.003	-.001
3. Scalar	2532.828***	652	.960	.954	.032 [.031, .034]	2 vs 3	-.002	.001	.001

Note: df = degree of freedom; CI = Confidence Intervals
***p < .001

Attention and Externalizing problems were very low ($d = 0.01$ and 0.12 , respectively), with males presenting more symptoms of externalizing problems than females. In socio-emotional competencies, females obtained lower scores than males, but the effect sizes were low ($d = 0.11$). Finally, males showed higher health-related quality of life levels than females, with a small-medium effect size ($d = 0.35$).

Convergent and Criterion Validity

As shown in Table 8, the intercorrelations between the MHC-SF subscales were high. In the relationship between the MHC-SF subscales and the remaining measures, the highest positive correlations observed were with the measure of HRQoL and social-emotional competencies (large effect size). Similarly, the highest negative correlations were between the different types of well-being of the MHC-SF and the Y-PSC-17 Internalizing

Problems subscale and the SEDS-S general distress scale (moderate-to-large effect sizes). The correlations between the MHC-SF subscales and the ADH and Externalizing Problems subscales of the Y-PSC-17 were negative and of small-to-medium magnitude. Lastly, the correlation between the MHC-SF subscales and age was negative and of small magnitude, indicating a downward slope where adolescents reported lower levels of well-being at older ages, with a slight increase at age 18, which was nonsignificant.

Normative Information for MHC-SF Scales

Each MHC-SF subscale is scored by the sum of the items of that scale. A child’s score on the scale can then be used to obtain the corresponding percentile score. The normative information for each of the three MHC-SF subscales for the whole sample, for the three subscales, and the total score is shown in Table 9.

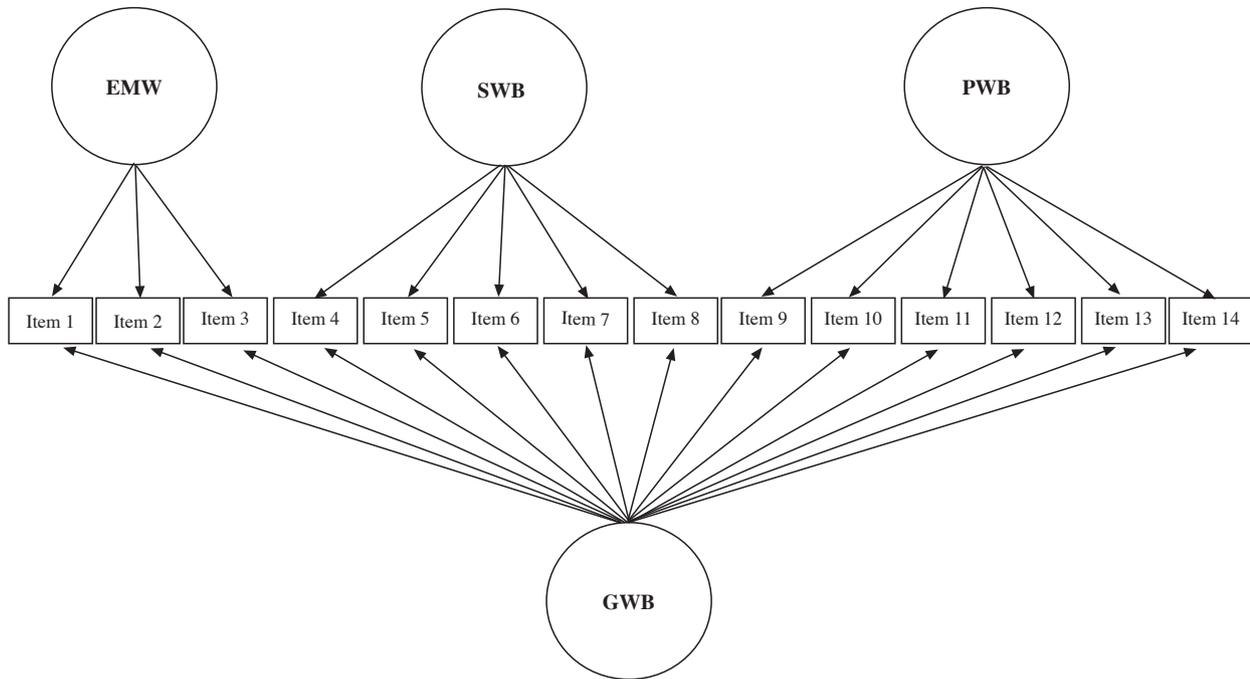


Figure 2. Tested model of MHC-SF structure: bi-factor model. Note: GWB = General Well-being; EWB = Emotional Well-Being; SWB = Social Well-Being; PWB = Psychological Well-Being

Table 6
Standardized Factor Loadings of the Mental Health Continuum-Short Form

	Correlated-Factors			Bi-Factor Structure			
	Emotional WB	Social WB	Psychological WB	Emotional WB	Social WB	Psychological WB	Global WB Score
Item 1	.512			.167			.478
Item 2	.869			.380			.781
Item 3	.895			.413			.799
Item 4		.619			.122		.602
Item 5		.679			.178		.640
Item 6		.778			.500		.623
Item 7		.704			.408		.595
Item 8		.805			.511		.682
Item 9			.746			.209	.708
Item 10			.631			.219	.587
Item 11			.693			.243	.649
Item 12			.650			.392	.586
Item 13			.728			.426	.660
Item 14			.805			.034	.818

Note: WB = Well-being

Discussion

As expected, this study found different sources of reliability and validity evidence (structural, convergent, and criterion) for use of the MHC-SF with Spanish adolescents. The CFA to evaluate the fit of the initially proposed three-correlated-factor model showed adequate goodness-of-fit indices. However, the bifactor model received stronger support, showing an optimal fit. This finding is consistent with previous studies in adolescent samples supporting the three-factor model (e.g., Carvalho et al., 2016; Guo

et al., 2015; Kennes et al., 2020; Keyes, 2006a, 2006b, 2009; Lim, 2014; Luijten et al., 2019; Matos et al., 2010) and also with some studies of Spanish-speaking adults (Peña-Contreras et al., 2017). Additionally, it is fully consistent with other studies reporting that the bifactor CFA fit better than the three-factor CFA, and the bifactor ESEM fit better than the three-factor ESEM and bifactor CFA (Longo et al., 2020). However, the fit of the three correlated factors usually yields acceptable fit indices in those studies (see, for example, Longo et al., 2020). This was also the case in the study with Spanish-speaking adults by Echeverría et al. (2017). Similar

findings were reported in studies with samples of adolescents, such as with the sample of Portuguese children included in Longo et al. (2020) or the Hungarian adolescent sample of Reinhardt et al. (2020).

Secondly, our study met criteria for scalar invariance across gender, consistent with Carvalho et al. (2016), Guo et al. (2015), or Luijten et al. (2019), who found support for the full invariance across gender and age of the MHC-SF, both for the three-factor and the bifactor models. Our study also provides new, previously untested information, such as the criteria for longitudinal invariance, which implies scalar invariance over time, or the measurement in adolescents of the MHC-SF well-being dimensions at different time-points. This suggests that the adolescents' growth and/or development in the scores observed over time may be attributed to real development and/or changes

in the construct under investigation, not to measurement defects (Millsap & Cham, 2012).

By testing gender and longitudinal invariance, this study also provides new evidence on gender-attributable differences in the MHC-SF subscales. Thus, gender differences found in this study ($d = 0.08 - 0.15$) were consistent with prior research establishing that males are more likely to report significantly higher scores on well-being dimensions, but with small effect sizes (Petrillo et al., 2015). Research comparing the levels of well-being dimensions across gender has generally reported the absence of gender differences (Joshnloo & Jovanović, 2017) or only minor differences (i.e., differences favoring females in Peña-Contreras et al., 2017, vs. favoring males in Petrillo et al., 2015). However, these studies were performed in adults and, to our knowledge, there are no studies that have compared gender differences among adolescents

Table 7
Descriptives for Females and Males and Reliability Coefficients of the Mental Health Continuum-Short Form and the other Scales

	Cronbach's Alpha (95% CI)		Omega (95% CI)		Mean score (SD)		Cohen's d a-b
	Females	Males	Females	Males	^a Females	^b Males	
Well-Being:							
Emotional	.80 (.79, .81)	.77 (.75, .78)	.82 (.80, .83)	.79 (.72, .81)	13.83 (3.30)	14.31 (3.05)	-0.15***
Social	.85 (.84, .86)	.83 (.82, .84)	.86 (.85, .86)	.83 (.82, .84)	19.65 (5.61)	20.33 (5.50)	-0.12***
Psychological	.86 (.86, .87)	.86 (.85, .87)	.86 (.85, .87)	.86 (.85, .87)	28.02 (5.75)	28.50 (5.60)	-0.08**
General	.92 (.91, .92)	.93 (.92, .93)	.93 (.92, .93)	.92 (.91, .92)	61.51 (13.19)	63.12 (12.60)	-0.12***
General Distress	.89 (.88, .90)	.86 (.85, .87)	.89 (.89, .90)	.86 (.86, .87)	19.20 (6.95)	16.94 (5.97)	0.35***
Psychological problems:							
ADH symptoms	.68 (.66, .70)	.69 (.67, .71)	.70 (.68, .72)	.71 (.69, .72)	4.45 (1.98)	4.46 (2.07)	-0.01
Internalizing symptoms	.76 (.75, .78)	.73 (.71, .74)	.76 (.75, .78)	.72 (.70, .74)	3.74 (2.37)	2.79 (2.16)	0.42***
Externalizing symptoms	.65 (.63, .67)	.67 (.65, .68)	.66 (.64, .68)	.67 (.65, .69)	2.54 (2.07)	2.80 (2.15)	-0.12***
Health-related quality of life	.86 (.85, .86)	.83 (.85, .86)	.86 (.85, .86)	.86 (.85, .86)	37.38 (7.37)	39.80 (6.44)	-0.35***
Socio-emotional skills	.91 (.91, .92)	.90 (.90, .91)	.91 (.91, .92)	.90 (.90, .91)	110.62 (14.76)	112.24 (14.03)	-0.11***

Note: ADH = Attention Deficit Hyperactivity; CI = Confidence Interval; SD = Standard Deviation; Measures: Well-Being (Mental Health Continuum-Short Form); General Distress (Social-Emotional Distress Survey-Secondary); Psychological Problems (Youth-Pediatric Symptom Checklist-17); Health-related Quality of Life (KIDSCREEN-10 Index); Socio-emotional Skills (Social-Emotional Health Survey-Secondary)
* $p < .05$; ** $p < .01$; *** $p < .001$

Table 8
Correlations between the Mental Health Continuum-Short Form (MHC-SF) and Well-Being and Distress Indicators

	1	2	3	4	5	6	7	8	9	10
1. Emotional Well-Being	1									
2. Social Well-Being	.65***	1								
3. Psychological Well-Being	.70***	.72***	1							
4. General Well-Being	.84***	.91***	.92***	1						
5. General Distress	-.44***	-.38***	-.42***	-.45***	1					
6. ADH Symptoms	-.19***	-.21***	-.23***	-.24***	.35***	1				
7. Internalizing Symptoms	-.50***	-.46***	-.50***	-.54***	.67***	.35***	1			
8. Externalizing Symptoms	-.24***	-.26***	-.31***	-.31***	.35***	.46***	.36***	1		
9. Health-related Quality of Life	.66***	.63***	.72***	.75***	-.60***	-.30***	-.67***	-.34***	1	
10. Socio-emotional Skills	.60***	.61***	.70***	.72***	-.40***	-.31***	-.45***	-.41***	.67***	1
11. Age	-.13***	-.10***	-.12***	-.13***	.18***	.11***	.20***	-.10***	-.21***	-.17***

Note: ADH = Attention Deficit Hyperactivity; Measures: Well-Being (Mental Health Continuum-Short Form); General Distress (Social-Emotional Distress Survey-Secondary); ADH, Internalizing, and Externalizing Symptoms (Youth-Pediatric Symptom Checklist-17); Health-related Quality of Life (KIDSCREEN-10 Index); Socio-emotional Skills (Social-Emotional Health Survey-Secondary).
* $p < .05$. ** $p < .01$. *** $p < .001$

Table 9
Normative Information of the Mental Health Continuum-Short Form (MHC-SF) Scales for Adolescents (Percentile Scores)

Percentile	Emotional Well-Being	Social Well-Being	Psychological Well-Being	General Well-Being
1	5	7	12	28
5	8	10	18	39
10	10	12	21	45
15	11	14	22	49
20	11	15	23	51
25	12	16	24	54
30	12	17	26	56
35	13	18	27	58
40	13	19	27	60
45	14	19	28	62
50	15	20	29	64
55	15	21	30	66
60	16	22	31	67
65	16	22	31	69
70	16	23	32	71
75	17	24	33	72
80	17	25	34	74
85	17	26	34	76
90	18	27	35	78
95	18	29	36	81
99	18	30	36	84

Note: N = 5,479, boys and girls from 12 to 18 years old; Rating anchors: Emotional Well-Being (EWB) = 3-18 (3 items); Social Well-Being (SWB) = 5-30 (5 items), Psychological Well-Being (PWB) = 6-36 (6 items), and General Well-Being (GWB) = 14-84 (14 items)

in the MHC-SF dimensions of well-being. Additionally, our findings were consistent with the differences reported in previous studies of socio-emotional competencies and HRQoL in which males obtained higher scores than females (Piqueras et al., 2019). We also found differences in distress and internalizing problems, in this case, showing the opposite effect, that is, females obtaining higher scores on general distress and internalizing problems than males, with a small-to-medium effect size, also consistent with recent studies (Piqueras, García-Olcina et al., 2021). Although there are no conclusive results on gender differences in well-being (Matud et al., 2021), some authors indicate that a possible explanation for these findings is that well-being and mental health are dynamic and multidimensional and influenced by personal, biological, and cultural factors. Thus, some studies point out the importance of the different incidence of sex hormones in boys and girls during puberty (e.g., menstruation) or the weight of cultural influences exerting different levels of pressure on each gender (Aymerich et al., 2021). Specifically, recent studies indicate that gender roles are important determinants of mental health and well-being, underlining the key role of androgyny and masculinity as protective factors for them (e.g., Esteban-Gonzalo et al., 2021; Matud et al., 2021).

Our findings also revealed evidence of the reliability of the MHC-SF, due to salient reliability coefficients across dimensions (>.80). Evidence of convergent-criterion validity was also observed, as its subscales correlated positively with positive measures such as HRQoL and social-emotional competencies, and negatively with distress outcomes. These findings are consistent with those reported previously in adults in the U.S., the Netherlands, Canada, Denmark, Italian, or South Africa, among others (Keyes et al.,

2008; Petrillo et al., 2015; Santini et al., 2020; Westerhof & Keyes, 2010, among others) and in adolescents (ages 12-18) in Asian countries (e.g., Guo et al., 2015; Lim, 2014), Portuguese children and adolescents (Carvalho et al., 2016; Matos et al., 2010), Dutch adolescents (Kennes et al., 2020; Luijten et al., 2019), Hungarian adolescents (Reinhardt et al., 2020), and American (Keyes, 2006a, 2006b).

Regarding the relationship between the MHC-SF subscales and age, we note that this was not a central aim of this work. However, the small negative relationship in our study is consistent with previous works indicating a decrease in the levels of subjective well-being identified as of age 11-12 onwards, and more marked among girls (Aymerich et al., 2021; González-Carrasco et al., 2017). This decline in well-being seems to coincide with the beginning of adolescence. Adolescence is a transition period from childhood to adulthood. This decrease in levels of well-being from the age of 11-12 onwards could be explained by what could be called a “perfect storm.” Thus, during these early adolescent years, a series of physical, cognitive, emotional, and social changes begin, along with an increase in risk situations, which implies greater emotional, psychological, and social vulnerability (Papalia et al., 2015; Solmi et al., 2021).

Finally, about one-fourth of the sample (27.4, 28.8, 28.9, and 26.7% for EWB, SWB, PWB, and General Well-Being, respectively; 75th centile) showed a high level of well-being, whereas around 10-15% (11.7, 14.1, 13.7, and 13.9%, respectively; 90th centile) showed a considerably high level. These normative data also showed that MHC-SF scores follow negative asymmetric distributions, but this can help to identify general, emotional, social, and psychological well-being among adolescents. Unfortunately, to our knowledge,

no studies provide normative data on the MHC-SF, so a comparison was not possible. However, other studies have reported estimates of the population prevalence of the mental health categories, using the categorical diagnosis proposed by Keyes (2006c). According to this classification, studies in adolescents have reported the prevalence of flourishing levels of well-being ranging from 11.7% among Korean adolescents (Lim, 2014) to 37% among American adolescents (Keyes, 2009) or to 54.3% among Dutch adolescents (Luijten et al., 2019).

Although the present study makes important contributions, it also has several limitations. These include the absence of an equivalent well-established measure of well-being measures, the absence of data on areas under the curve at optimal cut-off points in this study, and the sample's representativeness because we recruited it exclusively from the southeast of Spain. Other limitations could be the sampling method followed and the exclusive use of self-reported measures. These limitations make it difficult to generalize the results of the present study.

Despite these limitations, the present work provides the first empirical evidence of the validity and reliability of the MHC-SF among Spanish adolescents. As expected, the MHC-SF was shown to be a useful, reliable, and valid ultra-brief web-based measure for assessing well-being in adolescents. Specifically, the MHC-SF shows evidence of reliability and validity in Spanish adolescents, being invariant over time and between males and females, although

with males' slightly higher scores on well-being. Consequently, its use could be extended in future research as a measure of well-being.

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