2023, Retos, 49, 401-407

Development and validation of a scale to assess Psychological Well-being in physical activity and sports: the PWBPA scale

Desarrollo y validación de una escala para evaluar Bienestar Psicológico en Actividad física y deporte: la escala PWBPA

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Abstract. The aim of this study was to develop and validate a scale to assess psychological well-being in physical activity and sport context, based on Ryff's theory (2014) and the definition of psychological well-being proposed Piñeiro et.al (2021). For that purpose, a Likert type instrument with 51 items was designed. The scale was applied to 584 participants (63% women) with aged between 15 and 29 years (M=19.05; SD 2.97), from secondary schools and universities from different autonomous communities of Spain. After the statistical analysis, eliminating the items with low values, the final instrument was composed with 40 items (6 dimensions). The results showed that the scale manifests high reliability (α= .965), as well as high levels of explained variance. In conclusion, the research provides a valuable instrument, supported by a scientific theoretical basis, for the evaluation of psychological well-being through physical activity and sports practice in Spanish youth.
Keywords. Mental Health; Physical Activity; Eudaimonia; Assessment; Youth.

Resumen. El objetivo de este estudio fue desarrollar y validar una escala para evaluar el bienestar psicológico en el contexto de la actividad física y el deporte, basándose en la teoría de Ryff (2014) y en la definición de bienestar psicológico propuesta por Piñeiro et al. (2021). Para dicho propósito, se diseñó un instrumento tipo Likert con 51 ítems. La escala fue aplicada a 584 participantes (63% mujeres) con edades entre los 15 y los 29 años (M=19.05; DE 2.97) de escuelas secundarias y universidades de diferentes comunidades autónomas de España. Luego del análisis estadístico, eliminando ítems con bajos valores, el instrumento final quedo compuesto por 40 ítems (6 dimensiones). Los resultados muestran que la escala manifiesta alta fiabilidad (α= .965), así como también altos niveles de varianza explicada. En conclusión, esta investigación provee un valioso instrumento, apoyado por una base teórica científica, para evaluar el bienestar psicológico a través de la práctica de la actividad física y el deporte en la juventud.
Palabras clave. Salud Mental; Actividad física; Eudaimonia; Evaluación; Juventud.

Fecha recepción: 20-12-22. Fecha de aceptación: 06-05-23
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Introduction

Mental illness is a growing worldwide public health concern contributing to poor health outcomes, premature death, human rights violations and more than US$ 1 trillion per year in economic losses (WHO, 2019;2023). It is well known that people living with mental health conditions are more likely to face other physical health problems (e.g., HIV, TB.), causing early mortality of 10-20 years. However, mental health, and especially wellbeing, remains a neglected part of global efforts to improve health (WHO, 2019;2023). One of the main targets for the WHO Special Initiative for Mental Health (2019-2023) is that all people achieve the highest standard of mental or psychological wellbeing to prevent and reduce mental concerns (WHO, 2019-2023).

Psychological wellbeing has been classically conceptualized as the subjective appraisal of one's functioning, mood and satisfaction with life complements the concept of mental health to represent this important dimension (Diener et al., 1999). However, from Ryff's theoretical approach, psychological wellbeing focuses on the process to personal growth rather than on pleasurable, pain-avoiding activities, thus making the individual feel alive and authentic (Ryff and Singer, 2006). Ryff (2014) proposed a multidimensional psychological wellbeing model called the Integrated Model of Personal Development (IMPD), consisting of six dimensions: self-acceptance, autonomy, personal growth, purpose in life, environmental mastery and positive relations with others.

Recent studies on this field have shown that psychological wellbeing is protective for a range of health outcomes (Steptoe et al., 2015) and found to be associated with higher educational outcomes in adolescence and better occupational functioning in adulthood (Villar et al., 2003; Ryff, 2018; Bloodworth et al., 2012). These initial results emphasize the need for improving the knowledge about promotion of wellbeing during childhood and adolescence where the greatest risks of behaviors affecting wellbeing occur.

As it has recently reviewed (see Piñeiro-Cossio et al., 2021), a growing body of literature has proposed a key role of physical activity (PA) and sports in the promotion of wellbeing and related variables. PA has proven to have an indirect effect on the perception of psychological well-being and to provide benefits to the well-being of developing individuals, manifesting itself in physical, social and psychological aspects (Blanco et al., 2022; Fuentes, 2022).

In this sense, it has been reported effects of sports-based programmes on mental health, wellbeing, brain, and cognitive development (Käll et al., 2015; Bidzan-Bluma and Lipowska, 2018), satisfaction with appearance and other psychological variables among adolescents (Conolly et al., 2011; Ho et al., 2017; McNamee et a., 2016). As a

recent examples, Bakır and Kangalgil (2017) and Smedegaard et al. (2016) stated changes in the mental wellbeing of participants who took part in sporting activities while Gül and cols. (2017) reported that PA and sports influenced the individual development of the different dimensions of psychological wellbeing. These initial results draw a developing field that might show stronger influence of PA on psychological wellbeing by using specific instruments developed for this purpose. However, to date, there is still a gap in research on the use and validation of specific questionnaires to evaluate the impact of PA and sports on psychological wellbeing of children and adolescents.

Based on this theoretical framework for psychological wellbeing and aspects inherent to PA such as movement and corporeality, Piñeiro-Cossio et al., (2021) proposed a specific definition for psychological wellbeing in PA (PWBPA): "PWBPA is the state of optimal psychological functioning in the context of physical activity, which encompasses accepting one's strengths and limitations, being independent in decision-making and self-assessment, choosing or creating favourable environments, interacting positively with others in PA and sports, developing one's potential to the fullest, and seeking meaning and purpose in life based on PA values." In this context, a questionnaire of specific PWBPA might help to establish how PA may influence wellbeing in children, adolescents, and young adults.

Therefore, the aim of our study was to develop and validate the PWBPA Questionnaire according to the six dimensions specified by Ryff (2014) in his theoretical model of well-being and the definition previously presented. To that end, we used a qualitative study design, a modified Delphi technique, to develop the scale and then a quantitative cross-sectional study to establish its validity.

Methods

Participants

This instrument considers the adaptation and validation of an instrument to measure the psychological well-being of a particular population. To validate the scale presented in this study, a convenience sampling was used (non-probability sampling). 584 participants from several public and private universities and secondary schools from diverse autonomous communities of Spain participated, of which 63% were women (n=368) and 37% men (n=216) with age ranged between 15 and 29 (M=19.05; SD=2.97).

This kind of sampling took place due to the easy accessibility to these educational centers. In order to participate in the study, students had to be between 15 and 29 years old and report doing some type of physical activity or sport.

The study design considered the Spanish legal framework regulating the protection of personal data according to the Organic Law 3/2018 of December the 5th, and the fundamental principles established by the Declaration of Helsinki (World Medical Association, 2013). Ethical approval was obtained from the Research Ethics Committee of the Autonomous Community of Aragon (CEICA) and active consent was obtained from all participants. For this purpose, each participant provides their written consent to participate in this study.

Instrument, design, and method

The following steps were used in the development of the instrument: 1) The main objective of the test use was identified, in which the Psychological Wellbeing and the Physical Activity and Sports concepts were included; 2) The specific construct based in Ryff's psychological wellbeing theory was defined (Ryff, 1989; 2006; Ryff & Keyes, 1995), following the constructs based in the 6 dimensions or key components of the model: self-acceptance (knowing and accepting the multiple aspects of ourselves, including the conscience of one's strengths and limitations), positive relations with others (experiment a deep and healthy connection with significant others), personal growth (developing one's potential and talent to the fullest from a continuous developing feeling), purpose in life (have goals in life and feel that it has meaning, purpose, and direction), environmental mastery (manage life situation with a sense of mastery and competence), and autonomy (have self-determination, judge independence and internal self-regulation) (Ryff & Singer, 2008; Ryff, 2014); 3) The next step was the design of the test based on theory and implicated constructs. 95 items were initially drafted. After a first filter conducted by psychology and Physical activity experts, the number of items was reduced to 51; 4) The Delphi protocol (Reguant-Álvarez & Torrado-Fonseca, 2016) was followed to obtain the consensus or agreement degree of specialist on the problem posed, items redaction and suitability. Nine physical activity, Sport Science and Psychology experts participated developing the items and initial instrument design; 5) A preliminary trial of the items involved 54 subjects, and subsequently; 6) a pilot study with 584 participants with similar characteristics of our study sample. After these steps, items were evaluated to test if they met established criteria.

The Physical Activity Psychological Wellbeing Scale (PWBPAS) is initially made up of 6 dimensions and 51 items: Self-Acceptance, Autonomy, Environmental Mastery, Personal Growth with 9 items each; Social Relationships, and Purpose In Life with 8 items each one. The PWBPAS is a Likert Scale with punctuation between 1 (Totally disagree) to 6 (Totally agree).

Data Analysis

To assess the factorial structure of the PWBPAS Scale in the 584 Spanish participant's sample, a Confirmatory Factor Analysis (CFA) was conducted, using maximum likelihood estimation method.

Data univariate normality was analyzed through the

values of skewness and kurtosis. CFA was carried out by testing the Ryff model (Ryff, 2014) composed of 6 dimensions or factors. Subsequently, to verify the stability of the model in different populations, the factorial invariance was extracted by means of a multigroup CFA. To determine if the scale is invariant with respect to sex, the configural invariance (M1: invariance of the scale structure between the groups), metric invariance (M2: invariance of the factor loadings between the groups), strong invariance (M3: invariance of the intercepts between the groups), and strict invariance (M4: the invariance of the residuals is added to the invariance of factor loads and intercepts) were progressively evaluated (Byrne, 2008; Chen, 2007).

Models' adjustments were conducted examining several indexes: the value $\chi 2$ divided by degrees of freedom (CMIN/DF), the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the Akaike information criterion (AIC), and expected cross validation index (ECVI). Values between 3 and 5 in the CMIN/DF ratio, values lower than .08 in RMSEA and higher than .90 in CFI must be taken into account for a model to be considered adequate. Likewise, small values indicate a correct fit of the model in AIC and ECVI (Kline, 2011; Schermelleh-Engel, Moosbrugger & Müller, 2003) The invariance of the measurement between groups was assessed following the recommendations of Chen (2007), according to which the cut-off values for ΔCFI and ΔRMSEA should be $\leq .01$ and $\leq .015$, respectively.

Descriptive analysis was performed by calculating the mean and standard deviation, as well as the skewness and kurtosis values. Internal consistency was evaluated using Cronbach's Alpha (α), considering values above .70 and correct values between .80 and .90 (Steiner & Norman, 2009). In addition, the corrected item-test correlation coefficient was used to evaluate the discriminative capacity of the items. Next, the convergent validity was verified by calculating correlations, the average variance extracted (AVE) and the composite reliability (CR) of each of the factors. Hair et al. (2006) suggested that suitable values for AVE should be greater than .5 while suitable values for CR would be above .6.

The common method bias was also calculated using the Harman's one factor test. Podsakoff, McKenzie, Lee & Podsakoff (2003) state the values below 50% of total explained variance indicate that the study results are not affected by common method bias.

To carry out all the data analysis processes the software packages IBM SPSS v22.0 (IBM Corp., 2013) and IBM AMOS V23.0 (Arbuckle, 2014) were used.

Results

Item Analysis and Reliability of the Scale

Table 1 Shows descriptive statistics between genders regarding dimensions.

Table 1.
Descriptive statistics between genders regarding dimensions

	Gender	N	Mean	SD	Sig.
Self-acceptance	Men	216	4,8975	,82254	.000
	Women	368	4,2946	1,07995	
Positive relations with others	Men	216	4,6204	,95827	.000
	Women	368	3,8940	1,21380	
Autonomy	Men	216	4,9843	,77010	.000
	Women	368	4,6418	,88147	
Environmental mastery	Men	216	4,9603	,75989	.000
	Women	368	4,4658	,90039	
Personal growth	Men	216	5,0706	,82199	.000
	Women	368	4,6145	1,00659	
Purpose in life	Men	216	4,9120	,91169	.000
	Women	368	4,2184	1,10485	

Table 2 shows the descriptive statistics of the different items. The item-total correlation values are equal or higher to 3.5., except for items 6, 11, 15, 20, 21 and 22. The skewness and kurtosis indexes are below 1.96, which indicates similarity to the normal curve of the distribution. These results allow the use of factorial analysis techniques. The internal consistency reliability of the scale (Cronbach's alpha) is .965.

Table 2.
N° item, mean (M), standard deviation (SD), skewness, kurtosis, corrected item-total correlation and Cronbach's Alpha (α) if an item is removed (α without item) from the initial 51 items.

N°	M	SD	Skewness	Kurtosis	Corrected item-total correlation	α if the element is removed
1	4.52	1.221	-.696	.008	.688	.964
2	4.26	1.541	-.589	-.724	.435	.965
3	4.62	1.279	-.724	-.276	.624	.964
4	4.75	1.191	-.818	.085	.712	.964
5	4.96	1.016	-.961	.801	.357	.965
6	4.15	1.327	-.506	-.453	.243	.965
7	4.44	1.355	-.722	-.152	.693	.964
8	4.54	1.464	-.816	-.301	.635	.964
9	4.49	1.471	-.871	-.148	.690	.964
10	4.45	1.527	-.767	-.400	.659	.964
11	2.20	1.403	1.122	.361	.149	.966
12	3.33	1.665	.023	-1.219	.372	.965
13	4.05	1.563	-.451	-.823	.696	.964
14	4.13	1.642	-.475	-.900	.629	.964
15	5.27	1.071	-1.665	2.675	.308	.965
16	4.96	1.212	-1.294	1.329	.416	.965
17	4.85	1.256	-1.139	.762	.596	.964
18	5.02	1.072	-1.205	1.375	.606	.964
19	4.78	1.133	-.886	.369	.678	.964
20	2.88	1.517	.511	-.722	.071	.966

21	5.11	1.088	-1.322	1.523	.305	.965
22	3.03	1.584	.276	-1.115	.130	.966
23	4.69	1.158	-.876	.660	.643	.964
24	3.86	1.534	-.272	-.933	.351	.965
25	4.77	1.130	-.974	.873	.647	.964
26	4.58	1.223	-.818	.340	.563	.964
27	4.45	1.228	-.632	-.118	.712	.964
28	4.61	1.141	-.647	.126	.637	.964
29	4.66	1.270	-1.010	.558	.700	.964
30	4.90	1.061	-.899	.403	.560	.964
31	4.49	1.192	-.625	-.098	.711	.964
32	4.63	1.184	-.662	-.183	.637	.964
33	4.87	1.111	-.890	.460	.713	.964
34	4.82	1.127	-.992	.840	.679	.964
35	4.87	1.196	-1.014	.475	.708	.964
36	4.55	1.212	-.661	-.090	.743	.963
37	4.78	1.133	-.850	.409	.691	.964
38	4.74	1.225	-1.066	.770	.703	.964
39	4.88	1.165	-1.012	.490	.772	.963
40	4.57	1.335	-.772	-.086	.750	.963
41	5.11	1.075	-1.170	.876	.646	.964
42	4.78	1.239	-.962	.367	.692	.964
43	4.78	1.322	-1.042	.333	.713	.964
44	4.40	1.587	-.761	-.478	.730	.963
45	4.29	1.670	-.639	-.839	.630	.964
46	3.77	1.692	-.183	-1.203	.626	.964
47	4.77	1.211	-.982	.518	.753	.963
48	4.84	1.199	-.954	.315	.682	.964
49	4.71	1.307	-1.016	.427	.709	.964
50	4.61	1.197	-.887	.546	.623	.964
51	4.41	1.338	-.740	-.035	.740	.963

Confirmatory Factor Analysis

Table 3 shows the results obtained for the goodness of fit of the measurement models tested. In the first place, the adjustment indexes of the model composed of 6 factors and 45 items are observed. After eliminating the 6 items with inappropriate values of corrected element-total correlation (values below .35), the model presented correct fits indexes. However, after the results of this first model, the items 5,16,24,30 and 41 presented loads of less than .40 in the corresponding factor. For this reason, we proceeded to eliminate them and propose a second model with 6 factors and 40 items, which presented better adjustment values.

Table 3.
Goodness of fit indexes

	CMNI	DF	CMNI/DF	RMSEA	TLI	CFI	AIC	ECVI
6 factors and 45 items model	1729.088	931	1.848	.050	.908	.913	1928.088	5.773
6 factors and 40 items model	1338.762	725	1.847	.050	.923	.928	1528.762	4.577

Invariance Analysis

To determine invariance according to sex, configural invariance (M1), metric invariance (M2), strong invariance (M3) and strict invariance (M4) were progressively evaluated. Likewise, the adjustment of the base model without restrictions was evaluated in both groups separately obtaining different values (table 4), but similar between women and men. After that, the structure of the instrument between the groups (M1) was analysed resulting in excellent values. M1 is the reference model for constraint nesting for M2, M3 and M4 models. Subsequently, the metric invariance (M2) was analysed finding adequate fit indexes and also similar values to those for M1 (RMSEA = .001, ΔCFI = .000) indicating that there are no differences between the models and consequently metric invariance. With this condition, it was possible to compare the strong invariance. M3 values were adequate and the differences with M1 were within the expected limits (ΔRMSEA = .002, ΔCFI = .010), so the existence of strong invariance could be affirmed. Finally, strict invariance was studied obtaining adequate values. Regarding the differences with M3 (ΔRMSEA = .000, ΔCFI = .002) these are within the margins and this type of invariance could be confirmed.

Table 4.
Measurement invariance

Model	CMNI	DF	CMNI/DF	RMSEA	CFI	AIC	ECVI
Men			1.260	.047	.926	1103.332	9.511
Women			1.520	.049	.931	1291.738	3.925
M 1	2459,284	194	1.526	.038	.912	2845.344	7.817
M 2	2491,089	160	1.512	.037	.912	2897.772	7.961
M 3	2537,528	139	1.557	.039	.902	2895.018	7.953
M 4	2760,455	97	1.561	.039	.900	3016.498	8.287

Note. M1: Configural invariance; M2: Metric invariance; M3: Strong invariance; M4: Strict invariance.

Validity and Harman Test

The data convergent validity was verified by calculating the matrix of correlations between the factors involved in the study with a significant and positive correlation between them. Following that, internal consistency was assessed with Cronbach's Alpha obtaining adequate values. The calculations of CR (composite reliability) and AVE presented acceptable values for both (table 5). Finally, the results of the exploratory factor analysis explained 46′89% of the total variance, which indicated that the common method bias did not significantly affect the results of the study.

Table 5.
Factors and items by factor. Correlations between the scale factors, Cronbach's Alpha (on the diagonal), average variance extracted (AVE) and composite reliability (CR).

Variables	1. Self-acceptance	2.Positive relations with others	3. Autonomy	4. Environmental mastery	5. Personal growth	6. Purpose in life	AVE	CR
1. Self-acceptance	(.889)	.583**	.744**	.787**	.738**	.727**	.604	.914
2. Positive relations with others		(.866)	.573**	.711**	.695**	.658**	.644	.898
3. Autonomy			(.839)	.808**	.795**	.750**	.600	.869
4. Environmental mastery					(.891)	.866**	.828**	.606
5.Personal growth					(.929)	.846**	.666	.941
6. Purpose in life						(.910)	.623	.930

Note. **<.01; *<.05

Discussion

To develop the objective of this study, in the first place, a CFA of the 6-factor model belonging to Ryff's theory (2014) was carried out. As a preliminary step, the descriptive measures of the 51 original items were analyzed, as well as the univariate normality through the skewness and kurtosis coefficients. Items 6, 11, 15, 20, 21 and 22 were eliminated since they presented non-normal values for skewness and kurtosis and/or their item-total correlation coefficient was less than .35, which did not allow the application of factorial techniques (Cohen & Manion, 2002; Kline, 2011). After eliminating the 6 items, CFA was carried out with the maximum likelihood estimation method following the recommendations of Thompson (2004). The model fit was carried out by examining several indexes as Kline (2011) or Schermelleh-Engel, Moosbrugger & Müller (2003) proposed. The results of the first model with 6 factors and 45 items could be classified as adequate, but the information obtained through the analysis conducted us to eliminate items with loads less than .40 (items 5,16,24,30 and 41), cut point suggested by Williams, Onsman & Brown (2010). This situation was derived to re-specify the model with 6 factors and 40 items, which finally presented good fit values (Kline, 2011; Schermelleh-Engel, Moosbrugger & Muller, 2003).

Thereafter, the invariance of the model was verified following the procedure described by Byrne (2008), according to which the model was verified in the male and female population. Following the previous step, configural, metric, strong and strict invariance were also verified. Invariance between groups was assessed using the Chen (2007) recommendations regarding ΔCFI and ΔRMSEA. Obtained values indicated the existence of invariance.

Ultimately, internal consistency was verified using Cronbach's Alpha, convergent validity through correlation calculations, average variance extracted index and composite reliability of each factor. In addition, common method bias was calculated using the Harman one factor's test to determine validity and reliability of the 6-dimensions instrument to measure psychological wellbeing in physical activity and sport practice contexts in young people aged 15 to 29.

These results show that the PWBPAS is a useful instrument to measure the levels of wellbeing in contexts of physical activity and sport in young people and adolescents. This instrument could contribute to evaluating this construct in this specific context and with particular associated characteristics, being able to be used by researchers and agents involved in sport education programs, physical education, health promotion in schools and training with young people.

As main strengths of this study, we can highlight the use of the Delphi method (Reguant-Álvarez & Torrado-Fonseca, 2016) and the follow-up of the steps and protocol in a systematic way for the design and construction of the scale according to the model of the 6 dimensions (Ryff, 2014). Also, a solid and rigorous theoretical base and the robustness of the statistical tests carried out to evaluate psychometric properties. This instrument also responds to the definition proposed by this group of authors regarding Psychological Wellbeing in Physical Activity and Sport.

Regarding the limitations of the study, one of them has been the extension of the instrument due to the high number of original items. Although, and attempt was made to develop an efficient scale, the number of dimensions does not allow for a short instrument. Another limitation is the convenience and non-probabilistic sample (n = 584), which could lead to bias in the selection of participants. The participants of the study were 63% women and 37% men, which could desirably be more balanced. On the other hand, the age range (15 to 29) limits the use of this scale to a population with the same characteristics although this study could be transferred and applied with people over 29 years old. Despite the previous limitations, this scale has proven to be useful in fulfilling its objective.

Considering the previous antecedents, this instrument may be useful in future research, providing the possibility of evaluating psychological well-being under a concrete and clear conceptual framework and allowing to align concepts that can then be developed through various interventions in the sports, educational and public policy fields.

Conclusions

In the present study, a scale (PWBPAS) is presented to evaluate wellbeing in the practice of physical activity and sport in young Spanish people. Through the results, it was found that the scale manifested high reliability values, as well as high percentage of explained variance. This scale contains the 6 original dimensions of the used theory model (Ryff, 2014), finally being composed of 40 definitive items. In conclusion, the research provides a valuable instrument, supported by a scientific theoretical basis, for the assessment of wellbeing through physical activity and sport practice in youth. The instrument provided should be considered as a tool capable of evaluating psychological wellbeing in physical and sport practice context in young Spanish people.

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