

Validation of the Subjective Vitality Scale and study of the vitality of elderly people according to their physical activity

Validação da Subjective Vitality Scale e estudo da vitalidade nos idosos em função da sua atividade física

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Abstract – The main aim of the study was to validate the Portuguese version of the Subjective Vitality Scale - SVS for the Portuguese elderly population through of confirmatory factorial analysis. The existence of differences in the perception of subjective vitality among sufficiently active and insufficiently active older adults was also analyzed. A total of 309 Portuguese elderly (242 females, 67 males) aged 60-90 years ($M = 68.59$, $SD = 6.60$) participated in this study. Of the total sample, 256 are sufficiently active, while 53 are insufficiently active. The results show that the model was adjusted to data in a satisfactory way ($\chi^2 = 28.95$; $df = 9$; $CFI = .97$; $TLI = .94$; $SRMR = .04$; $RMSEA = .08$; $RMSEA\ 90\% \text{ CI} = .05 - .12$), and show a concurrent validity with the Portuguese version of the Satisfaction with Life Scale. The data obtained allow us concluding that the Portuguese version of the Subjective Vitality Scale can be used as a measure of subjective vitality in the Portuguese elderly population. It was also verified that the subjective perception of vitality is greater among individuals sufficiently active compared with their peers that do not reach the amount of practice of recommended physical activity.

Key words: Elderly; Factor analysis; Motor activity; Quality of Life.

Resumo – O objetivo do estudo foi validar a versão portuguesa da Subjective Vitality Scale - SVS para a população idosa portuguesa com recurso a uma análise fatorial confirmatória. Foi ainda analisada a existência de diferenças na percepção de vitalidade subjetiva entre idosos suficientemente ativos e insuficientemente ativos. Participaram neste estudo 309 idosos (242 sexo feminino, 67 sexo masculino) de nacionalidade portuguesa, com idades compreendidas entre os 60 e os 90 anos ($M = 68.59$; $DP = 6.60$). Do total da amostra, 256 são suficientemente ativos e 53 são insuficientemente ativos. Os resultados alcançados revelam que o modelo apresenta valores satisfatórios de ajustamento aos dados ($\chi^2 = 28.95$; $df = 9$; $CFI = .97$; $TLI = .94$; $SRMR = .04$; $RMSEA = .08$; $RMSEA\ 90\% \text{ CI} = .05 - .12$). Foi, também, obtida validade concorrente com a versão portuguesa da Escala de Satisfação com a Vida. Os dados obtidos permitem concluir que a versão portuguesa da SVS pode ser utilizada como medida de avaliação de vitalidade subjetiva na população idosa portuguesa. Verificou-se ainda, que a percepção subjetiva de vitalidade é maior entre os idosos suficientemente ativos comparados com seus pares que não atingem a quantidade de prática de atividade física recomendada.

Palavras-chave: Análise fatorial; Atividade motora; Idoso; Qualidade de vida.

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Received: 11 June 2016
Accepted: 02 April 2017



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INTRODUCTION

An increase in the elderly population has been recently verified, and by 2050, this population is expected to reach triple the number of people compared to 2010¹. In this context, well-being has been an important area of study², since people, in addition to prefer to live longer, also want to do it with more quality of life³.

Thus, subjective vitality, defined as a conscious experience of energy and vivacity⁴, is considered as part of the eudaimonic perspective of well-being, since the sensations of possession of energy and vitality are characteristics of perfect health⁵, reflecting an organismic state, as it can be affected by psychological and somatic factors⁴.

Therefore, pathological conditions that may deplete personal energy are conducive to diminishing subjective vitality⁴, in which the maintenance of physical capacity and social activity can delay the natural physical and cognitive decline associated with advancing age⁶. In fact, in an investigation on well-being in an elderly population, Kasser and Ryan⁷ confirmed the existence of negative and significant correlations between vitality, anxiety and depression and, on the other hand, positive and significant correlations between this and the perception of health and general well-being.

Thus, the practice of physical activity seems to be fundamental for this population, since individuals associated with regular physical activity programs can live longer and with higher quality of life, being important in the maintenance of their daily activities, as well as in the prevention of diseases that occur with aging³. This corroborate the findings in literature, where, in general, there seems to be a positive relation between physical activity and the great majority of well-being components, including vitality⁹.

Subjective vitality has been assessed through the Subjective Vitality Scale (SVS)⁴. Initially, this instrument was composed of 19 items; however, after an exploratory analysis, the authors eliminated 3 items, being reduced to 16 items. Still in the exploratory phase, the items were grouped in two factors: objectives / life purpose and vitality. Taking into account the initial aim of the study, assessing subjective vitality, Ryan and Frederick⁴ considered that only the 7 items associated with vitality factor as final version of the scale.

In order to verify the psychometric qualities of the scale through a confirmatory factor analysis, Bostic et al.¹⁰ demonstrated that there was adjustment of the SVS model (i.e., 1 factor / 7 items); however, this would improve if item 2 was eliminated. This item is constructed with a negative semantic structure (I don't feel very energetic) and obtained a very poor factorial weight (.14), reason why the authors suggest that the scale with a 6-item structure should be used.

The SVS reduced version (i.e., 1 factor / 6 items) has been the most commonly used self-report measure for assessing subjective vitality¹¹ in all age groups: youngsters¹¹, adults¹², and in the elderly²; and in several contexts: physical education¹³ or physical exercise^{14,15}.

In Portugal, Moutão et al.¹⁴ translated SVS and analyzed its psychometric properties through a confirmatory factorial analysis, using a sample of Portuguese adults practicing physical exercise, and a very satisfactory adjustment of the model to data was verified. In this study, an excellent internal consistency of the scale ($\alpha = .91$), as well as concurrent validity between subjective vitality and another dimension of well-being (satisfaction with life) was also verified.

Thus, in order to guarantee the validity and reliability of the Portuguese version of the SVS, when used in an elderly population, we propose as a main aim of this study to evaluate the scale measurement model through a confirmatory factor analysis in a sample of elderly people. Even if adapted to Portuguese through a sample where Portuguese elderly people were already included, the mean age of the sample of 32.70 ± 12.29 years gives us the indication of a reduced number of elderly subjects, so it becomes pertinent validation with a sample consisting exclusively of older adults.

Nevertheless, we intend to analyze for this population, in what way subjective vitality is differentiated as a function of individuals being or not sufficiently active.

METHODOLOGICAL PROCEDURES

Participants

A total of 309 Portuguese elderly subjects (242 female, 67 male) enrolled in senior universities and day centers (none of them were institutionalized), living in Ribatejo and western Portugal, with ages between 60 and 90 years ($M = 68.59$, $SD = 6.60$). Of the total sample, 256 individuals are sufficiently active and 53 are insufficiently active.

Instruments

Portuguese version of the Subjective Vitality Scale (SVS)¹⁴ - This questionnaire consists of 6 items that are answered on a seven-point Likert scale ranging from 1 "strongly disagree" to 7 "strongly agree." The value is calculated through the average response of the subjects that determines a total value, and the higher the value obtained, the greater the perception of subjective vitality.

Portuguese version of the Satisfaction with Life Scale (SWLS)¹⁶ - This questionnaire consists of 5 items that are answered on a seven-point Likert scale, ranging from 1 "strongly disagree" to 7 "strongly agree." The value is calculated through the mean response of subjects that determines a total value, and the higher the value obtained, the higher the perception of satisfaction with life.

International Physical Activity Questionnaire (IPAQ)¹⁷ - This self-report measure allows calculating the weekly energy expenditure of physical activities related to work, transportation, household obligations and leisure activities carried out for at least 10 continuous minutes. According to recommendations of Mazo and Benedetti¹⁷, for the elderly people, we

consider sufficiently active all those who perform moderate or vigorous physical activity for at least 150 minutes a week. All elderly people who have moderate or vigorous practice values of less than 150 minutes per week are considered to be insufficiently active.

Procedures

After the formal contacts with institutions, data were always collected in places and conditions similar to all the elements that participated in the study, being guaranteed the conditions so that they could be concentrated during the filling of the questionnaire. All participants agreed to be part of the study on a voluntary basis and informed consent was obtained, guaranteeing the confidentiality and anonymity of data collected. This study is part of a study that was approved by the Ethics Committee of the Regional Health Administration of Lisbon and Vale do Tejo (ARSLVT), of the General Health Department (DGS), and a favorable opinion to conduct the study was issued: Protocol 129 / CES / INV / 2013 of the Ethics Committee.

Statistical analysis

Statistical analysis was performed according to recommendations of several authors (Byrne¹⁸, Kline¹⁹, Kahn²⁰, Hair et al.²¹), and the maximum likelihood estimation (ML) method was used using the chi-square test (χ^2), degrees of freedom (df) and significance level (p). In addition, the following adjustment quality indexes were used: Standardized Root Mean Square Residual (SRMR), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA). In the present study, for the above indexes, the cutoff values suggested by Hu and Bentler²² were used: SRMR \leq .08, CFI and TLI \geq .95; RMSEA \leq .06 and the respective confidence interval (90% CI), although in the case of the incremental indexes (CFI and TLI), it is not necessary to generalize the cutoff values of Hu and Bentler, and it is also advisable to weigh values equal to or greater than .90²³.

The theory underlying the ML estimation method (maximum likelihood) assumes that data have normal multivariate distribution¹⁹, and it is necessary to analyze data normality through the Mardia coefficient. According to Byrne¹⁸, normalized Mardia coefficient higher than .50 is indicative that data do not have normal multivariate distribution, a situation that occurs with our sample (multivariate kurtosis: Mardia = 28.62, normalized Mardia = 25.76). For such situations, it is recommended to use a ratio of 15:1 in order to be able to use the ML estimation method²¹.

The convergent validity was also analyzed (to verify if the items are related to the respective factor), by calculating the average variance extracted (AVE) considering AVE \geq .50²¹ and composite reliability (CF), In order to evaluate the internal consistency of the factor, adopting as cutoff values CF \geq .70²¹.

In order to verify the assumptions of concurrent validity of SVS, a correlation analysis was performed through the Pearson coefficient r , between subjective vitality and satisfaction with life. As the subjective

vitality construct reflects well-being⁴, it is likely that it has strong and positive correlations with other well-being variables (satisfaction with life)²⁴.

Finally, in order to analyze the possible differences in subjective vitality between active and sedentary subjects of our sample, the t-Student test was used, which allows studying how the means of two populations are significantly different²⁵. The analysis was performed using the IBM SPSS AMOS 21 software²¹.

RESULTS

In relation to SVS (Table 1), it was verified that all levels of response were used and it was verified that item 1 (I feel “alive” and vital) obtained the highest mean response value 5.28. On the other hand, item 2 (Sometimes I am so alive I just want to burst) was the item with the lowest average response value 3.92. Regarding SWLS, it was also verified that all response levels were used, observing that item 4 (So far I have gotten the important things I want in life) was the one that obtained the highest average response value (5.02). On the other hand, item 5 (If I could live my life over, I would change almost nothing) was the least valued among subjects, with an average response value of 4.19. These mean response values in both scales are confirmed by the univariate non-normal distribution, which present a bias to the left, that is, subjects used the highest response levels for both scales, which is normal in questionnaires of this nature.

Table 1. Descriptive Analysis of Responses to Items SVS and SWLS

Item	Min-Max	M±SD	Skewness	Z value	Kurtosis	Z value
SVS 1	1-7	5.28±1.12	-0.64	-4.63	1.65	5.98
SVS 2	1-7	3.92±1.37	-0.07	-5.29	0.11	0.04
SVS 3	1-7	4.81±1.04	-0.60	-4.33	1.31	4.71
SVS 4	1-7	5.14±1.19	-0.77	-2.44	1.46	4.74
SVS 5	1-7	5.22±1.02	-0.58	-5.60	1.83	6.64
SVS 6	1-7	4.78±1.17	-0.59	-4.27	1.03	3.73
SWLS 1	1-7	4.76±1.92	-0.60	-4.35	0.89	3.22
SWLS 2	1-7	4.52±1.24	-0.17	-1.27	0.22	0.81
SWLS 3	1-7	5.01±1.15	-0.41	-2.97	0.85	3.08
SWLS 4	1-7	5.02±1.26	-0.55	-3.94	0.68	2.47
SWLS 5	1-7	4.19±1.60	-0.10	-0.75	-0.59	-2.15

Note: Min-Max (Minimum and Maximum); M (Mean); SD (Standard Deviation); SVS (Subjective Vitality Scale); SWLS (Satisfaction With Life Scale).

Analysis of construct validity

By the analysis of table 2, it can be verified that the SVS measurement model was adjusted to data according to cutoff values adopted in the methodology, being very close to values found by Moutão et al.¹⁴.

Through the analysis of figure 1, it is verified that the items present an adjusted factorial weight, varying between .50 and .73 (all statistically significant $p < .05$).

Table 2. Adjustment indices of the models tested.

Models	χ^2	df	CFI	TLI	SRMR	RMSEA	90% CI
SVS*	34.93	9	.97	.96	**	.07	.05 - .10
1	28.95	9	.97	.94	.04	.08	.05 - .12

* Model SVS Moutão et al.¹⁴; S-B χ^2 (Chi-square with Satorra-Bentler correction) ** (value not reported by the authors); χ^2 (Chi-Square) df (degrees of freedom); SRMR (Standardized Root Mean Square Residual); TLI (Tucker-Lewis Index); CFI (Comparative Fit Index); Root Mean Squared Error of Approximation (RMSEA); 90% CI (Confidence Interval RMSEA)

Regarding internal consistency, the composite reliability value of .80 is higher than the cutoff value of .70 suggested by Hair et al.²¹.

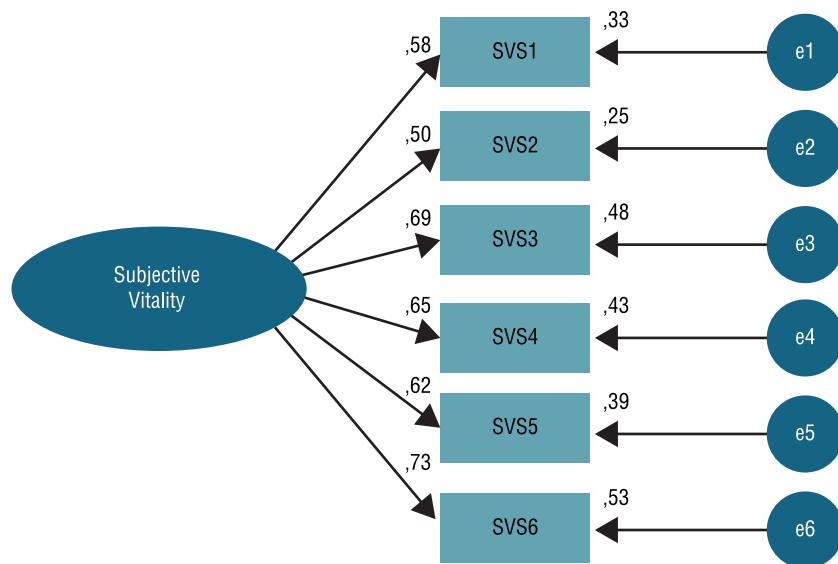


Figure 1. Standardized individual parameters of the initial SVS model

With regard to convergent validity, we have sought through AVE to confirm its existence. However, the value obtained for this indicator, as can be seen in table 3, is below the cutoff value of .50, thus indicating limitations of convergent validity of the Portuguese version of the SVS for this population. Regarding the concurrent validity (table 3), its existence is verified, since there was a positive and significant correlation ($r = .46$) among the well-being indicators studied.

Table 3. Composite reliability, convergent and concurrent validity

Items	Min-Max	M±SD	CR	AVE	CV*
Vitality	1-7	23.52±5.14	.80	.40	.46**

Note: Min-Max (Minimum and Maximum); M (Mean); CR (Composite Reliability); AVE (Average Variance Extracted); CV (Concurrent Validity); * (Correlation with satisfaction factor with life); ** (Significant correlation $p < .01$)

Based on table 4, there are statistically significant differences in the level of subjective vitality between sufficiently and insufficiently active individuals ($p = .003$).

Table 4. Analysis of differences between sufficiently active and insufficiently active individuals relative to subjective vitality

	Sufficiently active	Insufficiently active	df	t	p
	M±SD	M±SD			
Subjective Vitality	4.91±.77	4.60±.89	307	2.85	.003*

Note: M (Mean); SD (Standard Deviation); df (Degrees of Freedom); t (test statistic); p (p-value); *(Significant $p \leq .01$).

DISCUSSION

Taking into account the main purpose of the present study, to adapt and validate the Portuguese version of the SVS for the Portuguese elderly population, the model was adjusted to data, although not all cutoff values adopted in the methodology were achieved²², especially in the index incremental TLI and in the absolute RMSEA index. However, some authors (e.g., Byrne¹⁸, Hair et al.²¹ and Marsh et al.²³) suggest that the cut-off values of Hu and Bentler²² should not be generalized, under the risk of failing to reject good models, thus suggesting acceptable values from 90 in the incremental indexes (i.e. CFI and TLI) and between 05 and 08 for absolute indexes (i.e. SRMR and RMSEA). It is also noteworthy that these values are very close to the version of Moutão et al.¹⁴, from which this instrument was adapted, evidencing, therefore, its psychometric robustness in this age group.

As far as internal consistency is concerned, it was found that the composite reliability value obtained (.80) is higher than the suggested cutoff value (.70), thus giving good evidence of the SVS reliability for this population. Similar results were found in studies of the original version of Bostic et al.¹⁰, as well as of later validations^{14,15}, demonstrating that the subjective vitality factor measures the theoretical construct that it intends to measure.

Concerning the convergent validity, there are slight problems, since the AVE value (.40) was lower than the value adopted in the methodology (i.e., $AVE \geq .50$). However, all factorial weights are greater than or equal to .50 and significant in factor, which according to Hair et al.²¹, is indicative of convergent validity. Moreover, by analyzing the modification indexes, none of the items showed too high residual values, and this is also an indicator of convergent validity¹⁸.

With respect to concurrent validity, it was found that the scale of subjective vitality correlated positively and significantly with another cognitive dimension of well-being, more precisely with satisfaction with life, thus evidencing this type of validity. Kasser and Ryan⁷, in a study with elderly people living in nursing homes also verified this type of correlation between the two constructs, being also verified in other contexts, such as physical exercise^{14,15}.

Regarding the analysis of differences, the importance of the practice of physical activity on the perception of subjective vitality was confirmed. Statistically significant differences between elderly people who are sufficiently active and insufficiently active lead us to indicate that, in fact,

meeting the minimum recommendations for the practice of physical activity can effectively contribute to a greater perception of subjective vitality in this population. This is corroborated in the work of Strijk et al.⁹, where the authors concluded that physical activity can be used as a tool to increase the vitality of subjects.

In short, levels of subjective vitality are dependent on psychological factors and physical function that is negatively influenced by aging²⁶. In this sense, the practice of physical activity, as already verified, plays a fundamental role as it is seen as a means of promoting health²⁷, being fundamental in the maintenance of the daily activities of older adults³.

CONCLUSION

Based on the results found in the present study, it was concluded that the Portuguese version of the SVS (six items) presents satisfactory psychometric qualities for the evaluation of subjective vitality in Portuguese seniors. The results of the factorial analysis confirm the fit of the model with good internal consistency values, which are consistent with results reported by Moutão et al.¹⁴. Finally, it is suggested the implementation of initiatives and programs to promote physical activities to improve the perception of subjective vitality, since, sufficiently active elderly present a better perception of this variable, which is related to physical and mental well-being and consequently to health and quality of life.

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