Original Article

Physical activity and affect of the elderly: Contribution to the validation of the Positive and Negative Affect Shedule (PANAS) in the Portuguese population

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ABSTRACT

The concept of affect corresponds to the emotional dimension of subjective well-being (Diener, Emmons, Larsen, & Griffin, 1985). It is represented by two dimensions (negative affect and positive affect), which were the basis of the development of the Positive and Negative Affect Schedule - PANAS (Watson, Clark, & Tellegen, 1988). It was translated and validated for the Portuguese population by Galinha and Pais-Ribeiro (2005b). Nevertheless, because the Portuguese version was not validated in a sample of Portuguese elderly, the goals of this study consisted in the translation of the scale (PANAS) from the original version of 20 items and the validation of its measurement model (including a shortened version) for a sample of Portuguese elderly (n = 311), aged 60 years or older (M = 68.53; DP = 6.69); it was then tested by a confirmatory factorial analysis. The results demonstrated that the measurement model (two factors and 10 items) of the shortened Portuguese version of the PANAS presented acceptable psychometric qualities, which adjusted to the data in a satisfactory way (factorial weights ranging between .57 and .70 in positive affect and between .52 and .68 in negative affect). We also concluded that older adults who practice more physical activity perceive

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higher levels of positive affect $F(2, 297) = 3,78$, $p < .05$; $η2 = .025$, and lower levels of negative affect $F(2, 297) = 6,24$, $p < .001$; $η2 = .040$). **Keywords:** Physical Activity; Well-being; Affect; Elderly population; Confirmatory factorial analysis.

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INTRODUCTION

According to Galinha and Pais-Ribeiro (2005a, p. 209), the concept of affect is a "multifaceted construct and apparently difficult to integrate, without incurring overlays, omissions or even contradictions". Therefore, the concept of affect presents two independently related dimensions (Tellegen, Watson, & Clark, 1999; Watson et al., 1988): positive affect – in which a person feels excited, active and alert, and is associated with a state of high energy, with a maximum of focus and feelings of pleasure; and negative affect – which is considered to be a subjective dimension characterized by anguish and the absence of feelings of pleasure, and comprises a variety of aversive states of mind (e.g., feelings of guilt, fear, nervousness, contempt and anger).

However, according to Galinha and Pais-Ribeiro (2005a), there have been several approaches that contradict the independence of these two dimensions and even the bi-dimensionality of the concept of affect. As stated by the authors, it is possible to speak of a group of approaches that have claimed that there is a specific affect, which assumes that there are many types of affect, and consequently, a group of emotions that are understood as separate and independent. On the other hand, other approaches assert that there are two central affective dimensions – positive affect and negative affect.

Watson and Tellegen (1985) proposed a circular model of affect that is based on a bi-factorial structure (positive affect and negative affect) that defines two levels in each dimension (high and reduced positive affect and high and reduced negative affect). Their combination may result in differentiated feelings (pleasure-displeasure and strong-weak commitment). In this model, positive affect and negative affect are hierarchically related to other emotions.

In order to develop an assessment scale for affect (i.e., Positive and Negative Affect Schedule – PANAS), Watson et al. (1988) started with a large set of terms that are considered to be descriptors of emotions and applied them to a sample of university students. Based on the initial 60 terms (i.e., emotion categories) presented in the study by Zevon and Tellegen (1982), the authors reached a final scale with 10 items for positive affect and 10 items for negative affect. The scale revealed acceptable values of internal consciousness ($\alpha_{\text{positive affect}}$ = .88; $\alpha_{\text{negative affect}}$ = .87). It also revealed a significant negative correlation between negative affect and positive affect (r = -.17), which, as it is low in absolute terms, led the authors to nominate the factors as almost independent. The scale showed significant temporal stability (i.e., in a test-retest, with an interval of eight weeks), as significant differences in the results from the two moments were not found (p>.05). Regarding construct validity, the results from the exploratory factorial analysis revealed two factors (positive affect and negative affect) that explained 68.7% of the data variance and items with a factorial load ranging between .52 and .75 (positive affect) and between .52 and .74 (negative affect). Lastly, the authors also presented evidence of the discriminant and convergent validity of the scale with other related constructs (e.g., anxiety, depression, stress).

The psychometric qualities from the PANAS (Watson et al., 1988) were posteriorly analysed by Crawford and Henry (2004) and tested by a confirmatory factorial analysis in a sample of the adult population (537 women and 466 men). The authors tested several models (i.e., with one and two independent factors and two correlated factors), and the model with the best adjustment indexes was the two factor model (positive affect and negative affect). Correlated between them (r = -.297), however, the model only acceptably adjusted to the data when the authors allowed the correlation of several measurement errors between the items of the same factor (S-Bχ^2 = 508,3; χ^2 = 689,8; df = 156; RCFI = .94; SRMR = .52; RMSEA = .58). Similar results were obtained by Tuccitto, Giacobbi, and Leite (2010) in a study done with 223 athletes. However, contrarily to the previous study, the model revealed the orthogonality of the factors, because the correlation between them was not significant.

The Portuguese version of the PANAS was translated by Galinha and Pais-Ribeiro (2005b). In their study, similarly to the study of the original version (Watson et al., 1988), the authors translated the initial 60 terms (i.e., emotion categories) presented in the study by Zevon and Tellegen (1982). In their study, Galinha and Pais-Ribeiro (2005b) only presented results related to the internal reliability of the factors ($\alpha_{positive\ affect}$ =.86 and $\alpha_{negative\ affect}$ =.89). In addition, it was verified that there was a correlation between the two dimensions (r = -.10) of identic magnitude to the original scale. Nonetheless, the final Portuguese version of the PANAS (two factors, 20 items) is not equivalent to the original version of the PANAS, although they represent the same emotion categories.

The measurement model of the Portuguese version of the PANAS (Galinha & Pais-Ribeiro, 2005b) was posteriorly analysed by Galinha, Pereira, and Esteves (2013), who used a confirmatory factorial analysis in a sample of 303 adults. The results from the model of two factors and 20 items did not adjust to data in a satisfactory manner (χ^2 = 408.4; df = 169; CFI =.86; RMSEA = .08; SRMR = .08), leading the authors to test other alternative models (e.g., correlation between measurement errors, cross-loadings). Thus, the authors concluded that the model that adjusted the best was the one that represented a structure of two factors with 10 items each, but which allowed a crossed factorial load (cross loading) of the item “excited” (originally associated with positive affect with .61) with negative affect (.37), and specified correlations between the measurement errors from several items among the same factors (χ^2 = 277.9; df = 160; CFI =.93; RMSEA = .06; SRMR = .06).

As the PANAS is an instrument that is frequently used in the assessment of the concept of affect, some authors have evidenced the need to develop a shortened version of that scale. Therefore, Kercher (1992) chose five items for each dimension from the original version by Watson et al. (1988) and developed a scale of 10 items grouped into two dimensions (positive affect: “inspired”, “alert”, “excited”, “enthusiastic” and “determined”; negative affect: “fear”, “worried”, “nervous”, “scared” and “perturbed”), and this model was tested in adults with an average age of 78 years old. This reduced version of the scale showed good psychometric properties with highly acceptable adjustment values from the model to the data (χ^2 = 111; df = 33; CFI = .93; NFI = .91).

Later, Mackinnon et al. (1999) obtained similar results in a sample of 2725 adults from the version presented by Kercher (1992), with acceptable adjustment values from the model (χ^2 = 767.9; df = 34; GFI = .94); however, the value of the RMSEA (.09) indicated that it would be possible to make some improvements to the model. Therefore, when the measurement errors from the items “perturbed” and “worried” were correlated, it was possible to verify an improvement in the adjustment values (χ^2 = 294.5; df = 32; GFI = .978; RMSEA = .052). Beyond that, when the association (cross loading) of the item “excited” was considered with the negative affect factor, improvements in the model’s adjustment were observed (χ^2 = 128.6; df = 31; GFI = .990; RMSEA = .034).

Thompson (2007) developed another shortened version of the PANAS (i.e., I-PANAS-SF: International Positive and Negative Affect Schedule Short Form) based on the original version of the PANAS (Watson et al., 1988), which was intended to essentially measure the affect. First, items were eliminated using a qualitative methodology, because, according to the author, some of the items lacked clarity, were ambiguous, or they were not suitable to measure the affect trace. Afterwards, based on an exploratory factorial analysis (using the main components method), the author eliminated the items that contributed less to the validity and fidelity of the instrument. Therefore, a scale of 10 items was produced, which was divided according to the following arrangement: positive affect – “Determined”, “Alert”, “Inspired”, “Excited” and “Enthusiastic”; negative affect – “Fear”, “Nervous”, “Perturbed”, “Angry” and “Scared”. The scale produced good results for reliability and validity.

The I-PANAS-SF (Thompson, 2007) was further tested in a study of model invariance between two different cultures that was conducted by Karim, Weisz, and Rehman (2011). In addition to the acceptable adjustment values presented by the model in each of the cultures (France (χ^2 = 48.68; df = 34; CFI = 0.95; RMSEA = .63) and Pakistan (χ^2 = 99.67; df = 34; CFI = 0.92; RMSEA = .75)), it also presented evidence of invariance between the two countries; however, such evidence was only partial, because the results only indicated configurable (i.e., free model) and scalar (i.e., fixed covariance) invariance, as metric (i.e., fixed factorial loads) and residual (i.e., fixed measurement errors) invariance only succeeded when the parameters associated with three items were released.

Also Galinha, Pereira, and Esteves (2014) developed a shortened version named the PANAS-VRP based on the Portuguese version of the PANAS (Galinha & Pais-Ribeiro, 2005b). In this study, the authors tested several alternative models based on the following assumptions, namely: five items with the highest factorial weight for each of the factors; five items with the highest factorial weight, but that represented at least four categories of emotions described by Zevon and Tellegen (1982) in each of the factors; lastly, because two of the items were not present in the original version of the PANAS (Watson et al., 1988), and in order to avoid compromising metric equivalence, thus allowing comparisons with international studies, those two items were substituted so that there was direct correspondence with the original scale. Thus, the PANAS-VRP was composed of the following items: positive affect – “enthusiastic”, “inspired”, “determined”, “interested” and “active”; negative affect – “scared”, “frightened”, “tormented”, “nervous” and “guilty”. Its measurement model of two factors and 10 items presented highly acceptable values of adjustment (χ^2 = 43.7; df = 34; CFI = .99; GFI = 0.96; RMSEA = .04) in a sample of 245 students from higher education institutions and from the vocational training system, aged between 19 and 57 years old. This model was again tested by the authors in another sample of 536 university students aged between 17 and 66 years old, and highly acceptable adjustment values were obtained (χ^2 = 104.1; df = 34; CFI = .96; GFI = 0.96; RMSEA = .06).

Therefore, considering the results from the abovementioned studies, especially those which refer to the Portuguese versions (Galinha & Pais-Ribeiro, 2005b; Galinha et al., 2013, 2014), some incongruences with this scale were verified; namely, a direct correspondence to the items from the original version with 20 items was not verified (Watson et al., 1988), because the Portuguese version was developed through the total translation of the 60 items developed by Zevon and Tellegen (1982). It is unclear whether or not the factors are orthogonal. Further, the adjustment values from the several models that have been tested only presented acceptable values when the correlation between the measurement errors of the items and/or the crossed factorial weights of items were allowed in more than one of the factors, although this situation has not been verified for the shortened version of the model (PANAS-VRP: Galinha et al., 2014).

According to Diener and Chan (2011), there is evidence that high levels of subjective well-being contribute to improvements in the health and longevity of individuals; some indicators of subjective well-being are positively influenced by the practice of physical activity (Solberg, Hopkins, Ommundsen, & Halvari, 2012), such as, for example, positive affect perceived by older adults (Strachan, Brawley, Spink, & Glazebrook, 2010).

Thus, considering that the PANAS is a measurement instrument that has been broadly used in the literature to assess the emotional component of subjective well-being, our main goal was to do a translation of the scale from the original version of 20 items, validating its measurement model (including a shortened version) for a sample of Portuguese elderly, aged 60 years old or older, as well as to analyse the differences in affect according to the amount of physical activity practiced.

METHODOLOGY

Participants

In this study, 311 individuals participated (n = 311), 244 females and 67 males, aged between 60 and 90 years old (M = 68.63; DP = 6.55), all of whom were participants in senior universities and nursing homes from the regions of Ribatejo and the western zone of continental Portugal. From the sample's totality, 79.7% were shown to engage in the regular practice of physical activity, with a frequency of between one and seven times a week (M = 1.73; DP = 1.53). Among the reported activities, maintenance gymnastics, aerobics, hydrogymnastics and walking were the most common.

Instruments

The Positive and Negative Affect Schedule (PANAS: Watson et al., 1988) is constituted of 20 items, which are answered on a Likert-type scale with five levels ranging between 1 ("none or very slightly") and 5 ("extremely"). Afterwards, the items are grouped in two factors that represent the degree of positive affect (e.g., "interested", "strong", "enthusiastic") and negative affect (e.g., "perturbed", "scared", "angry").

The International Physical Activity Questionnaire (IPAQ – short form) has been validated for 12 countries, including Portugal (Craig et al., 2003). This questionnaire is formed of four questions related to specific types of physical activity, e.g., walking and moderate and vigorous activities, in terms of the frequency and duration of each specific type of activity, as well as the time spent seated per day in a week. The data obtained by the IPAQ are converted into MET-min/week (metabolic equivalent) through the calculation of the marked minutes per week in each category of activities by their specific metabolic equivalent. The physical activity level of each individual is ranked according to the IPAQ's own recommendations, which present the following physical activity categories:

Category 1 (Low) – The lowest physical activity level, which corresponds to individuals who do not fulfil the criteria for categories 2 and 3, who are considered to be inactive; Category 2 (Moderate) – Individuals who meet one of the following criteria: a) three or more days of vigorous physical activity for at least 20 minutes a day; b) five or more days of any combination of walking, or moderate or vigorous physical activity, which reaches a total minimum of physical activity of at least 600 MET-minutes/week; Category 3 (High) – Individuals who meet one of the following criteria: a) vigorous activity for at least five days, reaching a total minimum of physical activity of 1500 MET-minutes/week; b) seven or more days of any combination of walking, or moderate or vigorous activities, which reach a total minimum of physical activity of at least 3000 MET-minutes/week.

Procedures

Procedures for Questionnaire Translation

For the instrument's translation and the adaptation of the original language (English) to the Portuguese language, methodologic procedures suggested by Vallerand (1989), advised by Banville, Desrosiers, and Genet-Volet (2000) and operationalized by Cid, Rosado, Alves, and Leitão (2012) were adopted. However, in contrast to what was proposed by Vallerand (1989), the translation/back translation technique (Brislin,

1970) was not used, but rather a committee approach methodology (Brislin, 1980). Therefore, the process was developed using five steps; 1) Preliminary Translation: this first step was done by the investigators with the help of two translators with higher education in English-Portuguese, and it produced the first version of the questionnaire; 2) First Evaluation Panel: the analysis/evaluation of the initial version was conducted individually by a jury formed by four specialists from different areas of scientific knowledge (Sport Sciences and Psychology), and the second version of the questionnaire emerged from the presented alteration suggestions; 3) Second Evaluation Panel: the second version of the questionnaire was again submitted for analysis/evaluation by another jury (different from that used in the previous step). This step only concluded when there was concordance between the specialists, and the opinions of all of the jury members were unanimous in relation to the item content in the new version of the questionnaire (third version); 4) Pilot Study: this step involved the elaboration of the initial instrument layout and the application of the third version of the questionnaire to 20 individuals (higher education students) in order to analyse and determine the difficulties in the comprehension and interpretation of the content of its items. From this step, the fourth version of the questionnaire emerged; 5) Final Review: a Portuguese language review (syntax aspects – orthography, grammar and sentence construction) was conducted by one Portuguese professor and the elaboration of the final layout of the questionnaire (final version) was completed.

Procedures for the Data Collection
After contacting the administrations of several senior universities and nursing homes, as well as obtaining the signatures on the informed consent forms from the participants, all of the data were anonymously collected and analysed, thereby assuring compliance with the principle of confidentiality. To provide further detail, the data were collected in a classroom context during the local functions of the senior universities, in small groups (20 people maximum) with a duration of about 20 minutes. The present work is part of a study that was approved as a whole by the Ethics Commission of the Regional Health Administration from Lisbon and Tejo Valley (ARSLVT), which issued a favourable judgment for the study: Judgment 128/CES/INV/2013 from the Ethics Commission.

Statistical Analysis
With respect to the data analysis, the recommendations operationalized by Byrne (2006), Hair, Black, Babin, and Anderson (2014), Kahn (2006), and Worthington and Whitakker (2006) were considered. For the estimation method, we used the maximum likelihood (ML) method, through the chi-square test, with the correction of Satorra-Bentler (S-Bχ^2: see Satorra & Bentler, 1994), which corrects values when the non-normal distribution of data is verified, leading to more satisfactory results (Chou & Bentler, 1995); this was used because the Mardia's coefficient value (1970) indicated a non-normal multivariate distribution of the data in the current study (Mardia = 35.3).

In addition to the S-Bχ^2 test and the analysis of the respective degrees of freedom, as well as the significance level (p), the following adjustment indexes were used: the Standardized Root Mean Square Residual (SRMR), the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA) and the respective confidence interval (90% CI). For the aforementioned indexes, in the current study, the cut-off values suggested by Hu and Bentler (1999) were adopted: SRMR$\leq$ .08, CFI e TLI$\geq$ 0.95 and RMSEA$\leq$ .06. The analysis was conducting using EQS 6.1 software for structural equation analysis (Bentler, 2002).

Regarding the convergent validity analysis (with the goal of verifying whether the items are related to their respective factor), a calculation of the extracted mean variance (EMV) was done, using the recommended reference values (EMV $\geq$.50) (Hair et al., 2014). In relation to discriminant validity (in order to assess whether the factors are sufficiently distinct from each other), we verified whether the square of the factors' correlations was lower than their EMV (Hair et al., 2014). We also calculated the composite reliability in order to assess the factors' internal consistency, adopting CR ≥.07 as the cut-off value, as suggested by Hair et al. (2014).

Lastly, in order to study the differences at the subjective well-being level (positive and negative affect) according to the amount of physical activity (IPAQ categories), we first used the univariate techniques of localisation measures and central tendency (mean) and dispersion measures (standard deviation), and posteriorly parametric techniques, namely the One-Way Anova test, to compare the means in more than two groups, complemented by a Tukey post-hoc test. The significance level adopted to reject the null hypothesis was $p \leq .05$. The data analysis was conducted using SPSS 20.0.

RESULTS

As can be observed in Table 1, we verified that the individuals used all levels of answers (i.e., between 1 and 5), and higher means were verified in the items corresponding to positive affect. Additionally, we observed that the positive scale values are skewed to the left, and the negative scale values are skewed to the right.

Table 1. Descriptive Analysis of Answers to PANAS Items

Item	Min-Max	M±SD	Skewness	Z Value	Kurtosis	Z Value
Item 1 (PA)	1-5	3.53±0.89	-0.83	-6.02	0.70	2.54
Item 2 (NA)	1-5	2.00±0.98	0.90	6.52	0.43	1.56
Item 3 (PA)	1-5	2.27±1.1	0.50	3.62	-0.51	-1.85
Item 4 (NA)	1-5	2.85±1.12	0.11	0.80	-0.72	-2.61
Item 5 (PA)	1-5	2.95±1.01	-0.19	-1.38	-0.43	-1.56
Item 6 (NA)	1-5	1.49±0.83	1.94	14.06	3.59	13.01
Item 7 (NA)	1-5	1.82±1.03	1.30	9.42	1.02	3.70
Item 8 (NA)	1-5	1.83±0.97	1.14	8.26	0.76	2.75
Item 9 (PA)	1-5	3.20±0.96	-0.26	-1.88	-0.13	-0.47
Item 10 (PA)	1-5	2.78±1.17	-0.11	-0.80	-0.92	-3.33
Item 11 (NA)	1-5	2.00±1.02	0.95	6.88	0.34	1.23
Item 12 (PA)	1-5	3.08±1.15	-0.14	-1.01	-0.83	-3.01
Item13 (NA)	1-5	1.60±0.99	1.91	13.84	3.09	11.20
Item 14 (PA)	1-5	3.01±0.99	-0.10	-0.72	-0.23	-0.83
Item 15 (NA)	1-5	2.60±1.18	0.45	3.26	-0.67	-2.43
Item 16 (PA)	1-5	3.48±0.95	-0.46	-3.33	0.25	0.91
Item 17 (PA)	1-5	3.72±0.94	-0.73	-5.29	0.46	1.67
Item 18 (NA)	1-5	2.44±1.16	0.52	3.77	-0.53	-1.92
Item 19 (PA)	1-5	3.70±0.96	-0.76	-5.51	0.69	2.5
Item 20 (NA)	1-5	2.07±1.04	0.85	6.16	0.15	0.54

Note: PA (Positive Affect); NA (Negative Affect); Min-Max (Minimum and Maximum); M (Mean); SD (Standard Deviation)

Construct Validity Analysis

With respect to the data's adjustment to the measurement model, as can be observed in Table 2, we verified that the initial model (i.e., two factors/20 items) did not adjust to the data in a satisfactory manner, as the cut-off values adopted in the methodology were not reached.

In this way, we searched for the potential fragilities of the model through an analysis of the residual values between the items and the modification indexes. The model was readjusted, with the elimination of item 3 ("excited") from positive affect after very high residual levels with other items (e.g., 2 "perturbed", 4 "worried", 18 "agitated", all from negative affect) were observed and because the Langrade Multiplier test and the Wald Test suggested that a strong relation (i.e., cross-loading) with the negative affect factor possibly existed. After this modification, the model's adjustment indexes improved slightly (see model 2 in Table 2).

Table 2. Adjustment indexes of tested models

Models	S-Bχ²	*df*	*P*	SRMR	TLI	CFI	RMSEA	90% CI
Model 1	419.47	169	.001	.104	.783	.807	.069	.061-.077
Model 2	298.26	151	.001	.073	.860	.876	.056	.047-.065
Model 3	68.96	34	.001	.048	.909	.932	.058	.038-.077
Model 4	63.69	34	.001	.061	.900	.924	.053	.032-.073
Model 5	61.79	34	.001	.068	.911	.933	.051	.030-.071

Note: S-B χ² = chi-square test with the correction of Satorra-Bentler; df = degrees of freedom; SRMR = Standardized Root Mean Square Residual; TLI = Tucker-Lewis Index; CFI = Comparative Fit Index; RMSEA = Root Mean Squared Error of Approximation; 90% CI = Confidence interval of the value of RMSEA. Model 1 (20 items); Model 2 (elimination of item 3); Model 3 (10 items resulting from statistical criteria and representation of emotion categories); Model 4 (10 items used by Galinha et al., 2014); Model 5 (10 items used by Thompson, 2007).

When the model still did not present good adjustment indexes with the elimination of item 3 (and eliminating more items would suggest major changes to the model), and considering that one of the work's objectives was to validate a shortened version of the PANAS, statistical factors were combined (residual values, modification indexes and factorial weights) for the criteria related to the representativeness of the emotion categories developed by Zevon and Tellegen (1982) in each of the factors. Therefore, a model formed by 10 items, five in each factor (see model 3 in Table 2, represented in Figure 1), composed of the items "strong", "enthusiastic", "inspired", "determined" and "attentive" (positive affect) and "riled up", "guilty", "scared", "angry" and "nervous" (negative affect), presented significant adjustment improvements in relation to the previous model (RMSEA = .058, 90% CI [.038-.077], TLI = .909; CFI = .932).

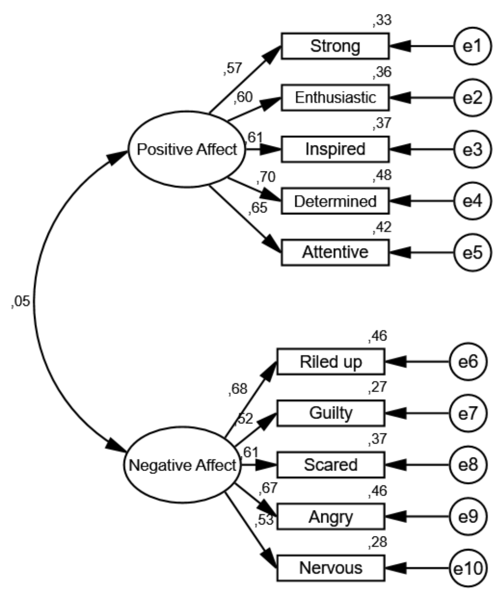

Figure 1. Standardized individual parameters from the shortened version of the PANAS - model 3 (10 items/2 factors)

As can be observed in Figure 1, regarding local adjustment, the model presents a non-significant positive correlation between the two factors (r = .05) and factorial weights ranging between .57 and .70 in positive affect and between .52 and .68 in negative affect. On the other hand, from an analysis of the factors' internal reliability, it is possible to verify that the Cronbach's alpha presents internal consistency values that we may consider as acceptable for both factors ($\alpha_{positive\ affect}$ =.76; $\alpha_{negative\ affect}$ =.74). Moreover, it was verified that none of the items increased the internal consistency of the respective factor if they were eliminated.

However, in addition to our shortened version of the model (model 3), we tested other model alternatives of other shortened versions in the literature, namely, Galinha et al.'s (2014) shortened and validated version for Portugal (see model 4 in Table 2) and the shortened version developed by Thompson (2007) (see model 5 in Table 2).

We verified that the adjustment values of model 4 (including the items used by Galinha et al., 2014) are similar to those of model 3. However, regarding the factorial weights, we verified that there are two items with factorial weights lower than .50 ("interested" and "fear"/"frightened"), and regarding internal consistency, lower values were found ($\alpha_{positive\ affect}$ =.70; $\alpha_{negative\ affect}$ =.70), compared to those found for model 3.

We also found that the model's adjustment values for model 5 (including the items used by Thompson, 2007) were similar to those of model 3. Regarding the factorial weights, however, they present lower values compared to those found for model 3 (four items with factorial weights below .50), and regarding internal consistency, lower values were verified ($\alpha_{positive\ affect}$ =.71; $\alpha_{negative\ affect}$ =.68).

Table 3. Composite reliability, discriminant and convergent validity

Factors	CR	EMV	Negative Affect
Positive Affect	.83	.40	.024*
Negative Affect	.82	.37	-

*Note: Composite reliability (CR); Extracted Mean Variance (EMV); *Squared correlation (r^2)*

Moreover, in Table 3, it is possible to verify that the measurement model presents good values of composite reliability (above .70), as recommended by Hair et al. (2014). Regarding convergent validity, the results show some weaknesses, because the values ($EMV_{Apositive}$ = .40; $EMV_{ANegative}$ = .37) are lower than the recommended ones (EMV ≥.50) (Hair et al., 2014). On the other hand, no factor presents discriminant validity problems, because the square of the factors' correlations is lower than their EMV (r^2 = .024) (Hair et al., 2014).

Regarding the analysis of the differences that existed at the positive and negative affect level, according to the amount of the individuals' regular practice of physical activity, as can be observed in table 4, in a general manner, it is verified that individuals tend to present higher levels of positive affect (3.29±0.69) compared to negative affect (1.94±0.69).

Table 4. Means and standard deviation of affect variables and physical activity categories

	Total Sample M±SD	Category 1 M±SD	Category 2 M±SD	Category 3 M±SD	F
N	300	29	195	76	
Positive affect (PA)	3.29±0.69	3.08±0.72	3.25±0.65	3.45±0.73	3.78*
Negative affect (NA)	1.94±0.69	2.07±0.78	2.01±0.70	1.70±0.59	6.24**

Note: M = Mean; SD = Standard deviation; Category 1: Low; Category 2: Moderate; Category 3: High. * p≤ .05; ** p≤ .001

In this way, through a One-Way Anova analysis, and after the confirmation of data normality by a non-significant p (i.e., p≥.05) in a Kolmogorov-Sminorv test, it was verified that there are significant differences in every factor: Positive affect F(2, 297) = 3,78, p =.024; η2 = .025; Negative affect F(2, 297) = 6,24, p =.002; η2 = .040. However, in the analysis of the Tukey post-hoc test, it was verified that the results show differences in the positive affect factor between individuals who belong to categories 1 (M = 3.08; SD = 0.72) and 3 (M = 3.45; SD = 0.73), p =.033; in the negative affect factor between individuals who belong to categories 1 (M = 2.07; SD = 0.78) and 3 (M = 1.70; SD = 0.59), p =.037, and categories 2 (M = 2.01; SD = 0.70) and 3 (M = 1.70; SD = 0.59), p =.003. Specifically, it was verified that regarding the positive affect, individuals from category 3 (high) present higher mean values, while in the negative affect variable, individuals from category 1 (low) present higher mean values.

DISCUSSION

Considering that the main goal of this study consisted in translating and validating a Portuguese version of the Positive and Negative Affect Schedule (PANAS: Watson et al., 1988), including a shortened version, for a sample of Portuguese elderly, aged 60 years old or older, it was initially verified that the original model (two factors and 20 items) did not adjust to the data in a satisfactory way, as the cut-off values of Hu and Bentler (1999) adopted in the methodology were not reached.

Therefore, we must return to what was mentioned by Hair et al. (2014), that is, the goal of confirmatory factorial analysis consists not only in providing answers about a model's adjustment, but also in providing pertinent information for its improvement; this complex analysis rarely involves the estimation of a single model, and other models may be assumed and possible alternative solutions may be sought, mainly when the estimation process reveals flaws in the main model (Hoyle & Panter, 1995), as is the case here. So, several authors (e.g. Byrne, 1994; Chou & Bentler, 1995; Worthington & Whittaker, 2006) have suggested a residual values analysis, which stems from the model's adjustment to the data and an analysis of the Lagrange Multiplier Test (LM) and the Wald Test (W).

Based on the abovementioned assumptions, we proceeded with the elimination of item 3 ("excited") from factor 1 (positive affect). This item had already presented a strong relation with factor 2 (negative affect) in other previous investigations (Galinha et al., 2013; Mackinnon et al, 1999). However, with no major improvements in the model's adjustment, and strengthening the main goal of validating a shortened version of this scale for the elderly population, we developed model 3 (two factors, 10 items). We considered the conjugation of the statistic criteria evidenced by the literature with the criteria of the representation of the emotion categories in each of the factors, as suggested by Galinha et al. (2014), which indicated the maintenance of four categories in each of the factors. This model presented significantly better adjustment values than the previous models.

The adjustment values from model 3 did not reach the very conservative cut-off values of Hu and Bentler (1999) that were adopted in the methodology, referring to incremental indexes (i.e., CFI e TLI). However, there are authors (e.g., Marsh, Hau, & Wen, 2004) who consider that the cut-off values of Hu and Bentler (1999) should not be generalized on the basis that they lead to the rejection of good models; further, the majority of authors recommend less conservative cut-off values (i.e., CFI e TLI ≥.90) (Hair et al., 2014; Marsh et al., 2004).

Regarding the comparison to the results obtained by the use of the items described in other versions (Galinha et al., 2014; Thompson, 2007), we verified that all of them meet the adjustment values equally, which does not allow us to consider one over the others. Moreover, we verified that, in model 3, both the internal consistency values and the factor weights are higher. It is also important to analyse the differences in the emotion categories (Zevon & Tellegen, 1982) used in each version. Thus, for Galinha et al.'s (2014) scale, it was verified that there are four categories of positive emotions ("excited", "proud", "strong" and "attentive") and four categories of negative emotions ("frightened", "perturbed", "tremulous" and "guilty"). In Thompson's (2007) scale, there are three categories of positive emotions ("proud", "attentive" and "excited") and four categories of negative emotions ("frightened", "angry", "perturbed" and "tremulous"). Concerning the version represented by model 3, there are four categories of positive emotions ("strong", "excited", "proud" and "attentive") and four of negative emotions ("angry", "guilty", "frightened" and "tremulous"). Thus, although the items used are different, we verified that the majority of emotion categories they represent are similar among the three models (3, 4 and 5), which may help to explain the reduced differences that were found.

Regarding the internal consistency values from the composite reliability indicator, considering the recommendations from Hair et al. (2014), they suggest that items from both factors (i.e., positive and negative affect) are similarly and simultaneously assessing the respective constructs. Regarding the convergent validity, the results show that the correlation between the items and the respective factor is not as strong as desired, as the values are lower than recommended (Hair et al., 2014). Nevertheless, as the results show that there is discriminant validity, it is possible to say that the constructs (i.e., positive and negative affect) are sufficiently independent from each other.

Another goal of this study consisted in an analysis of the differences at the positive and negative affect according to the amount of physical activity practiced. Regarding the results obtained, our data show a progressive effect of physical activity at the affect perception level, because individuals with moderate physical activity levels have a greater perception of positive affect, compared to those who have low physical activity levels. Consequently, high physical activity levels seem to be associated with a greater perception of positive affect, compared to those who have moderate physical activity levels. These results find support in the studies of Solberg et al. (2012) and Strachan et al. (2010).

CONCLUSION

Given the results, we may affirm that the measurement model (two factors and 10 items) in the shortened Portuguese version of the PANAS has acceptable psychometric qualities, which adjust in a satisfactory way.

On the other hand, the analysis of the differences in the level of positive and negative affect according to the amount of physical activity practiced verified that there seems to be a progressive effect of physical activity on the perception levels of positive affect.

Results from the current study, although they cannot be extrapolated beyond our sample, are an important contribute for the intervention at physical activity level in elderly population, these data may serve as a basis for a reflexion by the professionals of physical activity, regarding the way they can orientate their professional practice with elderly populations, assuming physical activity should, especially in these populations, be understood as a positive affect promotor.

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