Validity evidence for the Vitality Scale: Analysis of internal structure and convergence

Vitality Scale: Additional evidence

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Evidencias de validez para la Escala de Vitalidad: Análisis de estructura interna y convergencia

Érica de Oliveira Cezar*
https://orcid.org/0000-0002-1624-4021
Ligia de Santis *
Correspondencia: ligiasantis@gmail.com
https://orcid.org/0000-0001-5127-3285
Thaís Ramos de Carvalho**
https://orcid.org/0000-0002-3787-3396
Ana Paula Porto Noronha*
https://orcid.org/0000-0001-6821-0299

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* Universidade São Francisco (Brasil)

** Universidade Federal de São Carlos (Brasil)

Resumen

Vitality refers to the individuals' perception of their energy and their capacity to energize those around them, being an important mental health marker as it is associated to psychological constructs, such as emotional self-regulation. Considering that the Vitality Scale (VS) has only recently been used in Brazil, our objective in this study was to investigate further validity evidence, specifically based on the internal structure and convergent validity of the scale, through its relationship with external variables. A total of 209 participants (aged 17 to 62 years) answered the VS and the Emotional Self-Regulation Scale - Adult (EARE-AD). By means of a Confirmatory Factor Analysis, the one-factor structure of the VS proved plausible for the sample of the present study, with adequate reliability estimate for the scale (0.94). Evidence of convergent validity, through the relationship with related constructs, was verified through its correlation with the EARE-AD factors ($-0.15 \geq r \leq 0.57$). Results indicate the adequacy of the VS for use in Brazil. Thus, it is expected that, by means of future interventions and studies on vitality, the VS will provide professionals and researchers with a good instrument to help promoting the mental health and well-being of Brazilian people.

Keywords: *Positive psychology, character strengths, vitality, psychological assessment, psychometrics*

Abstract

La vitalidad se refiere a la percepción individual de su energía y capacidad para energizar a quienes los rodean, siendo un importante marcador de salud mental, ya que está asociada a constructos psicológicos como la autorregulación emocional. Considerando que la Escala de Vitalidad (EV) se ha utilizado recientemente en Brasil,

nuestro objetivo en este estudio fue investigar más evidencia de validez, específicamente basada en la estructura interna y convergente, por la relación con variables externas. Un total de 209 participantes (de 17 a 62 años) respondieron la EV y la Escala de Autorregulación Emocional - Adultos (EARE-AD). Mediante un Análisis Factorial Confirmatorio, la estructura unifactorial de la VS resultó plausible para la muestra del presente estudio, con una estimación de confiabilidad adecuada (0,94). La evidencia de validez convergente, a través de la relación con constructos relacionados, fue verificada a través de su correlación con los factores EARE-AD (-0,15 ≥ *r* ≤ 0,57). Los resultados indican la adecuación del EV para su uso en Brasil. Así, se espera que, a través de futuras intervenciones y estudios sobre vitalidad, el EV proporcionará a profesionales e investigadores un buen instrumento para ayudar a promover la salud mental y el bienestar de los brasileños.

Palabras clave: Psicología positiva, fortalezas del carácter; vitalidad, evaluación psicológica, psicometría

Introduction

Characterized as an intrinsic “energy” with spontaneous expression, which cannot be impelled by other people or by external factors (Deci & Ryan, 1985; Nix et al., 1999; Ryan & Frederick, 1997), vitality is intertwined with positive affect. Vitality refers to a positivity or high energy that can be autonomous and internally activated (Nix et al., 1999), varying not only depending on somatic factors, such as illness and tiredness, but also on psychological factors, such as being in love or having a “mission”. In the somatic aspect, vitality is an indicator of individual well-being and is related to good physical health and bodily functioning free from fatigue and disease. In the psychological sphere, it reflects an

integrated state of the “self”, in which experiences bear meaning and purpose (Ryan & Frederick, 1997).

Although developed without methodological rigor, the initial conceptions about vitality date back to the 90s, showing that energy and vitality had been the theoretical focus of many schools of thought on human functioning – such as those led by Freud, Jung, Reich, and Winnicott (Ryan & Frederick, 1997). In addition to such schools, the concept of vitality has also traditionally been used by the Eastern world in their perspectives, occupying a central place in their philosophical approaches (Lavrusheva, 2020), orienting oriental practices such as yoga, whose core objective is to increase vitality (Ryan & Frederick, 1997).

More recently, based on the encouragement of Positive Psychology, Peterson and Seligman (2004) developed the Values in Action (VIA), a guide for mapping, describing and classifying character strengths (as opposed to pathological characteristics) (Rashid & Niemiec, 2020). The authors describe six virtues (such as courage, humanity, and wisdom) that are associated with 24-character strengths. However, it should be noted that those virtues’ list was constructed only on a theoretical basis and was not replicated in the different studies conducted with samples from different countries (Littman-Ovadia & Lavy, 2012; Martínez-Marti & Ruch, 2016; Solano & Cosentino, 2018), including samples from Brazil (Noronha et al., 2015; Noronha & Batista, 2020). Thus, those strengths should be further investigated, which can be done by individually evaluating each of them – as is currently done in relation to vitality.

Because vitality is related to positivity and is an indicator of well-being, it is associated with different psychological variables. For example, vitality is positive correlated with authenticity (Akin & Akin, 2014), mindfulness (Akin et al., 2016), optimism

(Noronha et al., 2016), meaning in life (Vieira & Aquino, 2016), and positive affect (Rodrigues et al., 2021). Furthermore, vitality is negatively correlated with negative affect (Buchner et al., 2022; Rodrigues et al., 2021), loneliness (Arslan, 2021), fatigue (Goldbeck et al., 2019; Knoop et al., 2023), depression, anxiety, as well as somatic symptoms (Goldbeck et al., 2019).

Studies have also investigated potential predictors and consequences of vitality. Tummers et al. (2016), for example, showed that external labor factors, such as greater communication of tasks by the leader and work autonomy (i.e. the freedom to use your own approach and have control over your work), have a positive effect on vitality. Similarly, Leclaire et al. (2018) found a significant increase in vitality, and a consequent decrease in the rate of depression, after a Positive Psychology intervention with patients with multiple sclerosis.

In this connection, Noronha e Batista (2020) investigated the relationship between character strengths (including vitality) and emotional self-regulation. They found that vitality was the only character strengths that predicted the four factors of emotional self-regulation: coping strategies, externalization of aggression, pessimism and paralysis. Self-regulation skills contribute to the prevention or minimization of depressive feelings (Berking et al., 2014; Weiss et al., 2015) and are associated with psychological well-being (Santana & Gondim, 2016). The relationship between vitality and emotional self-regulation is expected, since vitality reflects a state of activity (physical and mental), indicating vivacity and enthusiasm– characteristics opposite to those present in people with depressive symptoms and feelings (American Psychiatric Association [APA], 2014).

Given its relationships, vitality is considered an important mental health marker (Rouse et al., 2015). Therefore, in order to make it possible to use these scientific findings

in identifying personal strengths or weakness and, consequently, when suggesting psychosocial interventions that would benefit people's mental health, it is essential to have available adequate instruments to evaluate this construct. Some foreign measures aim at this assessment, such as the Subjective Vitality Scale (SVS; Ryan & Frederick, 1997). The SVS was developed to assess the energy that the individual perceives to have available, presenting a single dimension (Ryan & Frederick, 1997). Although there is the possibility of adapting foreign measures to another cultural context, it is known that direct translation does not always ensure conceptual equivalence (ITC, 2017). In this sense, the construction of new measures allows cultural particularities to be addressed (considering that the expression of the latent trait may be different, depending on the culture) (Pacico, 2015). Therefore, new instrument development can better capture culturally embedded meanings of psychological traits (ITC, 2017), such as vitality.

In view of this, Noronha et al. (2016) developed the Vitality Scale (VS), for specific use in Brazil. These authors are part of a group of Positive Psychology scholars and used the VIA (Peterson and Seligman, 2004) as a basis to create the 21 items that make up the scale. The items of the Vitality Scale (e.g., “I feel enthusiasm”; “I don’t get tired easily”; “I like to pass on good energy to people”) were constructed to reflect both the subjective experience of energy and its expression in everyday behavior (demonstrating the ability to energize others), as proposed by Ryan and Frederick (1997). These authors conceptualized vitality as a phenomenological marker of well-being, closely related to the feeling of aliveness and vigor. Lavrusheva (2020) further expands this understanding by characterizing vitality as a multidimensional resource rooted in cognitive-affective regulation, motivation, and existential meaning. Similar items have been employed in recent studies that assess vitality through self-perceived energy and emotional tone (e.g.,

Buchner et al., 2022; Kamp et al., 2018). Therefore, the VS items are consistent with the theoretical propositions that define vitality as a construct encompassing personal energy, resilience, and the capacity to energize others.

Following their development, items were evaluated by a committee of experts in Psychology and in instrument construction, and by two groups of young people (aged 14 to 17), who participated in a pilot study. The results of this initial assessment indicated the theoretical adequacy of the items developed, demonstrating the content validity of the measure. Then, based on the responses of 122 adults (aged 18 to 65), exploratory analyses of the scale's internal structure indicated a single-factor structure for the VS. Evidence of convergent validity was also verified, through its correlation with optimism (Noronha et al., 2016).

Therefore, the VS presents adequate psychometric properties, including structural consistency and convergence with related constructs. However, the search for validity evidence for psychometric instruments is a process that involves the accumulation of evidence offering adequate scientific references for the interpretation of its scores (Peixoto & Ferreira-Rodrigues, 2019; International Test Commission [ITC], 2017; Primi et al., 2009). Thus, for the VS to be used for diagnostic purposes in psychology, additional validity evidence are needed for the instrument.

Having a measure like VS fit for use in Brazil could bring a series of practical implications – for example, in both clinical and organizational contexts. In clinical settings, vitality can serve as an important indicator of well-being, especially in cases of depressive symptoms. Considering the negative association between vitality and depression (Goldbeck et al., 2019; Ryan & Frederick, 1997), the VS may be used by clinicians to monitor therapeutic progress or as a screening tool to identify individuals with low energy

and engagement. In organizational contexts, the VS may support workplace mental health programs, particularly in the development of corporate well-being initiatives and burnout prevention. Studies have shown that job autonomy and supportive leadership enhance vitality, which in turn is associated with greater job satisfaction and performance (Tummers et al., 2016). Thus, the VS may help human resources professionals and organizational psychologists assess and promote psychological resources linked to productivity and emotional resilience in Brazilian workers.

Thus, our general objective was to gather further validation findings for the VS (Noronha et al., 2016). Specifically, we intend to verify evidence of validity based on the internal structure (considering a new Brazilian sample), and evidence of convergent validity, based on the relationship with theoretically related constructs – emotional self-regulation factors. We expected the single-factor internal structure of the VS to be identified as plausible, considering the new sample of the present study. Additionally, we expected moderate relationships between vitality and emotional self-regulation. Specifically, we expected a moderate and positive correlations between vitality and "Adequate coping strategies" factor, and moderate and negative correlations with the factors "Paralysis", "Pessimism" and "Externalization of Aggression".

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Method

Participants

A total of 209 individuals, that included women (67.9%; *n* = 142) and men (32,1%; *n* = 67, aged 17 to 62 (*M* = 31.32; *SD* = 11.65; 89,5% under 49 years old) participated in the study. Regarding education, 35.4% of the participants had incomplete Higher

Education (*n* = 74), followed by those with completed Higher Education (24.9%; *n* = 52), postgraduates (24.4%; *n* = 51) and those who had completed High School (10%; *n* = 21), among others (*n* = 11). Regarding monthly income, 34% of the participants reported earning 1 to 3 minimum wages (*n* = 71), followed by those earning up to 1 minimum wage (20.6%; *n* = 43), 3 to 5 minimum wages (16.3%; *n* = 34) and more than 5 minimum wages (12.9%; *n* = 27) – 16.2% participants did not answer this question (*n* = 33). The majority reported having a job (79.9%; *n* = 167). Among the participants who reported working, the average weekly work hours were 37.10 hours (*SD* = 13.07), ranging from 4 to 75 hours per week. Finally, the majority of participants (78.5%; *n* = 164) reported practicing some physical activity at the time of data collection.

Instruments

Sociodemographic questionnaire

This questionnaire was used to characterize the sample; it contained questions about age, gender, education, physical activity, among others.

Vitality Scale (VS)

Developed by Noronha et al. (2016), the VS is a self-assessment scale composed of 21 items, answered using a 4-point Likert-type scale, ranging from “it has nothing to do with you” to “it has everything to do with you.” Examples of items are: “I feel excited” and “I don’t get tired easily”. Through exploratory analyses (principal component analysis and parallel analysis), a unidimensional structure was indicated as appropriate for the instrument, with an explained variance of 39.74% and Cronbach's alpha of 0.91. Furthermore, evidence of convergent validity for the scale was also verified (correlation with the Revised Life Orientation Test – LOT-R Brazil of $r = 0.48$; $p < 0.001$) (Noronha et al., 2016).

Emotional Self-Regulation Scale – Adult (EARE-AD)

Developed by Noronha et al. (2019), the EARE-AD is a Brazilian measure composed of 34 items, answered on a 5-point Likert-type scale, ranging from “none of the time/not at all” to “always”. Through an exploratory factor analysis, a structure composed of four factors was identified: (a) “Adequate coping strategies” (composed of 15 items; example: “I try to think of ways out of the problem”), (b) “Paralysis” (six items; example: “I can’t understand why I’m like this”), (c) “Pessimism” (six items; example: “I think I’m worse than others”) and (d) “Externalization of aggression” (seven items; example: “I mistreat people”). The reliability of the factors was 0.98, 0.69, 0.88 and 0.92, respectively (Noronha et al., 2019). Authorization was obtained from the original authors for the research use of the Emotional Self-Regulation Scale – Adult (EARE-AD).

Data collection procedure

The project was approved by the Ethics Committee of San Francisco University (*Universidade São Francisco*, Brazil) (approval number: 3.390.703). Participants were recruited in gyms, clinics and universities in the interior of São Paulo, or were individuals who volunteered to participate in the survey. In all cases, participants only answered the measures after reading and signing the Free and Informed Consent Form (FICF; for those aged 18 and over) and the Free and Informed Assent Form (FIAF; for those aged 17 and their respective parents or guardians. After that, participants were instructed on how to respond to the questionnaires (administered in the following order: Sociodemographic Questionnaire, VS and EARE-AD). The instrument applications were in person, lasted about 20 minutes and were applied collectively or individually, depending on the participant's availability.

Data analysis procedure

Since the EV internal structure had already been explored previously, through an Exploratory Factor Analysis and based on data from another sample (Noronha et al., 2016), we evaluate additional psychometric evidence based on the internal structure of the VS, using a Confirmatory Factor Analysis (CFA) with the JASP 0.14.0 software (Love et al., 2019). This analysis aimed to evaluate the adequacy of the single-factor structure proposed by Noronha et al., (2016) to the data collected in the present study. The analysis was carried out using the Robust Diagonally Weighted Least Squares (RDWLS) estimation method, based on polychoric correlations – suitable for categorical data (Li, 2016). To analyze the fit of the data to the pre-established model, the following fit indices and criteria were evaluated: ratio of the chi-square to the degrees of freedom (χ^2/d.f. < 5 or, preferably, less than 3), Root Mean Square Error of Approximation (RMSEA < 0.08 or, preferably, less than 0.06 and with the upper limit of the confidence interval < 0.10), Standardized Root Mean Square Residual (SRMR < 0.08), Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) (CFI and TLI > 0.90 or, preferably, above 0.95). Factor weights above 0.40 were also considered adequate (Brown, 2015).

After reviewing the internal structure of the measure, the reliability of the VS was assessed by estimating the composite reliability. Estimates greater than 0.70 were considered adequate (Hair et al., 2009). Finally, to evaluate evidence of convergent validity, based on the relationship with theoretically associated constructs, the VS scores were correlated with those obtained with the application of the EARE-AD. Correlations of moderate magnitude (between 0.30 and 0.49; Cohen, 1988) were considered adequate evidence of this type of validity (American Educational Research Association, American

Psychological Association, & National Council on Measurement in Education [AERA, APA, & NCME], 2014).

Resultados

The CFA results indicated the single-factor VS structure proposed by Noronha et al. (2016) as plausible, presenting the following fit indices for the present sample: χ^2 = 154.37; *df* = 189 (p = 0.97); χ^2/df = 0.82; RMSEA = 0.00 [90% CI (0.00 – 0.00)]; SRMR = 0.06; CFI = 1.00 and TLI = 1.00. Table 1 presents the factor weights for each item, as well as the reliability estimate. All factor weights were greater than 0.40, and that the composite reliability value was adequate.

Table 1.

Factor Weights for the VS Items and Reliability Estimate for its Global Factor

Factor	Items	Standardized factor weight
Vitality	EV1	0.76*
	EV2	0.70*
	EV3	0.47*
	EV4	0.53*
	EV5	0.78*
	EV6	0.72*
	EV7	0.67*
	EV8	0.49*
	EV9	0.58*
	EV10	0.59*

EV11	0.60*
EV12	0.68*
EV13	0.71*
EV14	0.78*
EV15	0.57*
EV16	0.78*
EV17	0.76*
EV18	0.80*
EV19	0.70*
EV20	0.47*
EV21	0.44*
Composite reliability	0.94

Note. * = $p < 0.001$

Like the CFA, the results of the Pearson correlation analyses also indicated adequate evidence of validity for the VS. Thus, there were significant relationships with all EARE-AD factors, being: $r = 0.57$ ($p < 0.001$) with the factor “Adequate coping strategies”, $r = -0.46$ ($p < 0.001$) with the “Paralysis” factor, $r = -0.44$ ($p < 0.001$) with the “Pessimism” factor and $r = -0.15$ ($p < 0.05$) with the “Externalization of Aggression” factor. Thus, strong correlations were observed for the factor “Adequate coping strategies”, moderate for the factors “Paralysis” and “Pessimism”, and weak for the factor “Externalization of Aggression”.

Discussion

Vitality is a recognized important construct, as it functions as an indicator of physical and mental well-being (Ryan & Frederick, 1997; Rouse et al., 2015). Thus, the need for instruments with adequate psychometric properties to evaluate this construct stands out, in order to contribute, for example, to the development and evaluation of psychological interventions that benefit people's mental health, in the Brazilian setting. Since only initial evidence of VS use has so far been verified (Noronha et al., 2016), the general objective of this work was to provide further psychometric support for the measure. Specifically, in a new sample of respondents, we verified evidence of validity based on the internal structure and on the relationship with a test evaluating a related construct (convergent validity), in addition to reliability estimates.

Regarding the evidence of validity based on the internal structure, factor analysis results indicated that the single-factor structure verified by Noronha et al. (2016) was adequate for the data in this study, presenting factor weights and fit indices within the established criteria. Studies evaluating vitality in other cultural contexts have also identified single-factor structures as plausible for their measurements (Bălăceanu et al., 2022; Kamp et al. 2018; Ryan & Frederick, 1997). Among these measures, the SVS (Ryan & Frederick, 1997) stands out. In line with the VS, the SVS was developed to assess perceptions of vitality in a self-report format, presenting a single dimension (Ryan & Frederick, 1997). The instrument has already been adapted to different settings, and the appropriateness of the unidimensional structure has also been verified (Bostic et al., 2000; Buchner et al., 2022; Castillo et al., 2017; Rouseet al., 2015). For example, our results are in line with recent findings by Buchner et al. (2022), who validated the German version of the Subjective Vitality Scale (SVS-GM) and reported a strong unidimensional structure

with good internal consistency. Thus, the results of the present study in relation to the structure underlying the measure corroborate what has been verified in other studies that investigated the vitality assessment.

Considering the values of the factor loadings of each item we noticed that, although all VS items presented acceptable factor loadings (above 0.40), some items – such as EV3 and EV21 – showed comparatively lower weights. Despite all items' contribution to the overall good reliability and construct representation of the scale, this variation in the values of the factor loadings indicates different abilities of each item to represent the evaluated construct. Considering that the VS has a single-factor structure with 21 items, future studies could consider these factor loading results to propose a reduced version of the instrument – an objective that goes beyond the scope of this study.

Regarding reliability, the composite reliability value was also adequate (0.94) (Hair et al., 2009). This result is in line with the reliability estimate found in a previous study (Cronbach's alpha of 0.91), which was also adequate (Noronha et al. 2016), and confirms the reliability of the scores obtained using the instrument. Studies that estimate the reliability of scales are essential, considering that they provide information about the consistency of scores in the different applications of the instrument, which is directly related to measurement error. Considering that error is inherent to the psychological assessment process and impossible to be completely controlled by researchers, the presentation of this estimate and favorable results becomes fundamental (Peixoto & Ferreira-Rodrigues, 2019).

Regarding the relationship between VS and EARE-AD, the correlations found were all statistically significant. This result indicates that emotional self-regulation, as an indicator of psychological adjustment, is associated with vitality (Ryan & Frederick, 1997).

These findings align with international evidence regarding the role of vitality as a predictor of psychological health. For instance, Bălăceanu et al. (2022) found that vitality significantly predicted mental health indicators and job satisfaction among Romanian workers, highlighting its incremental validity beyond other psychological traits. Similarly, our study found that vitality is positively associated with adequate coping strategies, and negatively associated with maladaptive emotional patterns, which supports the understanding of vitality as a dynamic resource for psychological adaptation.

This result also corroborates those of Noronha e Batista (2020), who found that, among other variables analyzed, vitality was the only one that predicted the four factors of emotional self-regulation, reinforcing the association between these constructs. This association was expected, since both variables share several correlates, being associated, for example, with the minimization of depressive feelings (Ryan & Frederick, 1997; Weiss et al., 2015) and with quality of life and well-being (Santana & Gondim, 2016). Thus, since the instrument was able to empirically capture a theoretically predicted relationship with a related variable, it is understood that evidence of additional validity was verified for the VS, of the convergent type (Pacico & Hutz, 2015).

Specifically, regarding the relationship between VS and the EARE-AD factors, it is highlighted that, as expected, vitality showed significant correlations with all factors of emotional regulation, being positive with the factor that represents adaptive strategies and negative with the factors that represent maladaptive strategies. In this sense, the greater the vitality experienced: (a) the lower the paralyzing behaviors when faced with situations that produce negative emotions; (b) the lower the pessimism, which involves feelings of inability to solve problems, of worthlessness in relation to oneself and of inferiority in relation to other people and (c) less use of strategies related to aggression, such as

fighting, hitting or shouting and breaking objects. Furthermore, the greater the vitality presented by the individuals, the greater their ability to solve their problems, trying to do things they like when they are sad and reflect on their own feelings (when experiencing sadness and when reflecting on how they faced other similar situations in past moments); in other words, the greater the use of appropriate coping strategies (Noronha et al. 2016).

However, in relation to the magnitude of these relationships, this was different for the different emotion regulation factors. Thus, we verified a strong correlation with the factor Adequate coping strategies, moderate correlations with Paralysis and Pessimism factors, and weak correlation with the Externalization of Aggression factor. These differences can be explained by the theoretical nature of the constructs, but also by the criteria established for interpreting these magnitudes. Regarding the theoretical nature of variables, this variability is expected, in part, because, unlike vitality, emotional regulation (as measured by the EARE-AD) is a multidimensional construct. Thus, it is expected that people with high levels of vitality will have, for example, a greater capacity to cope with challenging situations, but also a lower propensity for externalization. Results such as these were verified in the present study.

Specifically, regarding the correlation with the factor “Externalization of Aggression”, although also in the expected direction (negative correlation), presented a value below the criterion used, indicating a weak relationship (r = -0.15) between VS and this factor from EARE-AD. This result indicates that, although vitality is related to emotional self-regulation, there are stronger associations with some factors, and weaker associations with others. In other words, vitality is more related to some facets of self-regulation (adequate coping strategies, paralysis and pessimism), and less to another (externalization of aggression). These data are consistent with the theory, since

aggressiveness is a construct that is associated with many others, such as impulsivity, for example (Ferreira, 2015). Therefore, although vitality is an important construct in this framework, other factors must also be considered. Since externalizing aggression is a multidetermined construct (Coccaro & Siever, 2002), individual correlations with each variable may be weaker than expected.

Concerning the criteria for interpreting the magnitudes of correlations, it is worth highlighting that authors present different ranges to represent moderate correlations. As a criterion used in the present study, Cohen (1988) considers correlations between 0.30 and 0.49 as an indication of moderate correlations. Dancey and Reidy (2019), on the other hand, proposed that moderate correlations are those that vary between 0.40 and 0.69 – which would include the correlation found between vitality and the Adequate coping strategies factor (r = 0.57). Furthermore, according to Kim and Abraham (2017), only correlations greater than 0.70 would represent relationships strong enough to indicate that the two instruments would measure the same construct – or variations of the same construct. Based on this information, it is not possible to state that VS and the “Adequate coping strategies” factor of the EARE-AD, would measure the same construct, but only two constructs that are related.

Thus, although an association was expected between vitality and emotional self-regulation, we did not expect that these correlations would be of the same magnitude for all factors, since vitality may be more strongly related to some self-regulation strategies, which was observed in the results of the present study. In other words, we understand that the correlations found between the VS and the EARE-AD are indicative of validity evidence for VS. Furthermore, the results of the present study go beyond the contributions

to the understanding of the psychometric properties of VS, promoting knowledge about vitality and its relationship with specific factors of emotional regulation.

Although this study contributed to a better understanding of the psychometric properties of the VS and its evidence of validity, some of its limitations ought to be highlighted, especially with regard to the sample. Initially, it is noteworthy that the sample of the present study was mainly composed of women and participants with complete and incomplete higher education. Even though these data corroborate previous evidence, which demonstrates the greater propensity of women and people with higher education to participate in research work (especially when data are collected online) (Stoop, 2005; Stoop et al., 2010), it would be important that future studies investigate VS characteristics based on more balanced samples in relation to participants' gender and education.

Furthermore, we should highlight that the sample in the present study presents a possible bias in connection with the manner participants were recruited, some in gyms, clinics and among groups that practiced physical activities. Some evidence has indicated that there is a relationship between the practice of physical activities and vitality (Couto et al., 2023). Thus, the fact that most of the study participants practiced physical activities (with high frequency) may be a source of bias. Based on balanced samples in relation to this variable, future studies should be able to evaluate this relationship using the VS – testing, for example, the invariance of its internal structure between physical activity practitioners and non-practitioners.

Another assessment of interest would be evaluating the invariance of the VS's internal structure in relation to the gender of the respondent. This assessment was not possible in the present study given the sample size and the unequal distribution of respondents between men and women (Millsap & Yun-Tein, 2004). We understand that

this limitation may be related to the recruitment strategy. As discussed by Stoop et al. (2010), volunteer-based and convenience sampling – especially in research involving well-being – tends to attract more women and individuals with higher educational levels. For future studies to address this limitation, it would be important to seek more diverse and representative samples in terms of gender, education, physical activity, and geographic region.

Still regarding the sample, we must highlight its age range. Diversity in the sample characteristics is important for studies that deal with the psychometric evaluation of measurement instruments, since it indicates that different population profiles are being represented. However, in the present study, it is important to highlight that, although in absolute numbers the variation in the age range of the sample is wide, there is an underrepresentation of older people (since 89.5% of respondents are under 49 years old). In view of this, it is important that future studies include a larger number of older individuals in evaluating the measure. This inclusion is even more important when it comes to assessing vitality, since there is evidence that the construct varies over time (Singh et al., 2023) and that it is as a marker of healthy aging and a core component of functional health in older adults (Knoop et al., 2023). With a larger and more representative sample in terms of age range, it will be possible, for example, to assess the invariance of the internal structure of the instrument regarding different age groups. Finally, given the dimensions of the Brazilian territory, future studies should also expand the regional diversity of the sample.

Conclusions

Despite these limitations, we concluded that, besides the evidence already presented by Noronha et al. (2016), the results of the present study indicate the suitability

of VS in measuring vitality in the Brazilian setting. To further substantiate its psychometric profile, we suggest that future studies seek evidence from other sources for the instrument, such as those based on the relationship with a criterion, on the consequences of testing and through experimental or quasi-experimental studies (Chan, 2014; ITC, 2017; Primi et al., 2009), besides analyzing the psychometric properties of its items. Furthermore, considering the unidimensional structure verified for the instrument in the present study, future studies could also suggest a reduced version of the measure (for example, through the analysis of factor loadings and psychometric estimates derived from Item Response Theory). With this, we expect to provide researchers and professionals with an adequate and reliable tool for measuring vitality in Brazil. In future studies, researchers should be able to use the scale (and its derived versions) to better understand the construct and its relationships, as well as to assess vitality and in intervention proposals aimed at improving the physical and mental well-being of Brazilian adults.

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