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Sports experience, affects and life satisfaction in Portuguese athletes with disabilities

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Abstract

This study aims to validate the Portuguese version of the Satisfaction with Life Scale (Cronbach's alpha = 0.82) and the Positive and Negative Affect Scale (Cronbach's alpha = 0.86 for positive affect and 0.89 for negative affect) for people with disabilities and to examine the association between engaging in physical activity and affective responses, investigating the relationship with satisfaction with life. 143 Portuguese with disabilities filled in the Portuguese version of the scales. The findings endorsed the single factorial structure and reliability of the Satisfaction with Life Scale [$\chi 2/df = 6.3$, B-S $p = 0.487$, TLI = 0.989, CFI = 0.995, SRMR = 0.0263, RMSEA = 0.043 (CI = 0, 0.130)]. For Positive and Negative Affect Scale, the results also confirmed the factorial structure and reliability [$\chi 2/df = 1.871$, B-S $p = 0.114$, TLI = 0.891, CFI = 0.918, SRMR = 0.0778, RMSEA = 0.078 (CI = 0.048, 0.108)]. On the other hand, the structural model presented satisfactory fit to the data [$\chi 2/df = 1.436$, B-S $p = 0.269$, TLI = 0.917, CFI = 0.930, SRMR = 0.0748, RMSEA = 0.055 (CI = 0.033, 0.075)]. Significant direct effects have been found, as has been theoretically proposed, namely: years of practice displayed a positive and significant association with positive affect; positive affect was positively associated with satisfaction with life ($\beta = 0.073$, CI = 0.020, 0.139; $p = 0.031$).

Keywords Affect, Disability, Psychometric properties, Satisfaction, Validity

Introduction

A International Classification of Functioning, Disability and Health [1], promotes the terms disability and incapacity to designate a multidimensional phenomenon that results from people's interaction with their physical environment. The concept of disability encompasses individuals facing participation limitations and restrictions as defined by the World Health Organization, based on the International Classification of Diseases [2]. These may include hearing, visual, motor, and/or intellectual impairments, which can occasionally hinder the individual's ability to perform daily activities independently. The World Report on Disability estimates that more than one billion people, around 15% of the global population lives with some form of disability. It is estimated that this figure will increase to 23.8% by 2050 [3].

In recent years, the social inclusion of people with disabilities has become increasingly important [4–7], supported by Convention on the Rights of Persons with Disabilities [8] and Sustainable Development Goal 3. Country governments are increasing their measures to monitor and promote the well-being of people with disabilities, in line with the principles defended by the Convention on the Rights of Persons with Disabilities [8], with actions to monitor and evaluate well-being and health, promote accessibility in public and private spaces,

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the possibility of inclusive education, access to employment opportunities, the expansion of specialized health services, actions to raise awareness and combat prejudice, legislation and social protection.

Subjective well-being is categorized by the existence of positive affect, the absence of negative ones, as well as a positive perception of satisfaction with life [9], acting as a positive factor for both the health and life expectancy/longevity of individuals [10]. Its construct is therefore made up of two dimensions: emotional, which refers to affect (positive and negative), and cognitive, which refers to satisfaction with life.

Dinner's model refers to the evaluation that individuals make of their lives, including global cognitive judgements of satisfaction and the event of positive and negative emotions [9], focusing on how people perceive and experience their lives, both from a cognitive point of view, characterised by satisfaction with life in specific domains (e.g., physical capacity or social relationships), and from an affective point of view, characterised by the stability between affects (positive and negative) [9, 11, 12]. This conceptual framework is consistent with the World Health Organization definition of health as encompassing complete physical, mental, and social well-being rather than just the absence of disease or illness.

However, besides Dinner's model had the theoretical assumption that the emotional dimension (i.e., affect) and the cognitive dimension (i.e., satisfaction with life) are orthogonal, and although they are interconnected, they act independently, some recent studies, applied to the context of sport in people with disabilities [13], physical activity in elderly [14], and exercise in gym exercisers [15], hypothesise that the emotional dimension directly influence the cognitive dimension (i.e., positive affect has a positive impact on life satisfaction, and negative affect has a negative impact). However, this model was tested in conjunction with motivational variables, so more studies are needed to test or reinforce this evidence.

Studies report that individuals with disabilities have lower levels of well-being compared to individuals without disabilities [16–18], reflecting a greater discrepancy between the assessment of their circumstances and their aspirations. Other living conditions, such as social and material deprivation, social isolation and loneliness, lack of employment and exposure to a range of potentially adverse life events (e.g. violence and discrimination), can influence this perception of well-being [3, 19].

Satisfaction with life scale

The Satisfaction With Life Scale (SWLS) is a widely recognized and frequently employed measure assessing the cognitive-judgmental aspect of subjective well-being [9]. The instrument proposed by Diener et al. [9], assesses the notion of life satisfaction through the overall judgement that an individual makes about their life. It is a single domain measure, as its five items are global and assess the overall judgement of satisfaction with life, which is one of the scale's strengths. Other strengths include the fact that it can be administered to different age groups, and that it is short and quick to answer [20, 21].

Since the instrument was created, has been widely applied. It has been translated into numerous languages, including Arabic [22], Czech [23], Chinese [24], French [25, 26], Spanish [27–29], Dutch [30], Portuguese [31, 32], Norway [33] or Russian [34]. In the same sense, the scale has been applied to different age groups, such as children [35], adolescents [28, 31], adults [25, 30], elderlies [14, 29, 36], students [9, 23, 24, 34], non-psychiatric medical outpatients [37], pregnant women [38], migrants [39, 40] and both sexes [13, 14, 27, 41], gym exercisers [42], and more recent, in athletes with disabilities [13] and Paralympic athletes [41].

The factor structure and validity of the SWLS instrument have been verified in several studies. Using exploratory and confirmatory factor analysis, the various studies show that the five items of the instrument tag a single dimension [9, 20, 23, 35, 43]. Test-retest reliability oscillated from 0.83 (2 weeks) to 0.54 (4 years), and alpha coefficients ranged from 0.79 to 0.89 [9, 20, 23, 35, 43]. These results support the instrument as a valid and reliable measure of the cognitive-judgement component of subjective well-being.

Positive and negative affect scale

Positive affect is associated with pleasurable experiences, giving feelings of enthusiasm, confidence, and happiness [44]. On the other hand, negative affect is related to suffering and discomfort, characterised by disagreeable experiences, giving rise to feelings such as sadness and guilt [44].

Positive and Negative Affect Schedule (PANAS) is an instrument that assesses positive and negative affect. It is a brief, easy-to-administer and measure both dimensions of affect. The instrument, in its original version, includes twenty items, ten corresponding to each of the type of affect. The psychometric characteristics of the tool were tested using a confirmatory factor analysis on a sample of the adults populations (537 women and 466 men) [44]. As it is an instrument frequently used to assess affect, authors have highlighted the need to develop a shorter version to make it easier and quicker to administer. Kercher [45] proposed an adaptation of the original scale, made up of 10 items congregated into two dimensions (positive affect: "inspired", "alert", "excited", "enthusiastic" and "determined"; negative affect: "fear", "worried", "nervous", "scared" and "perturbed"), showing good psychometric properties with acceptable model fit values (χ^2 = 111; df = 33; CFI = 0.93; NFI = 0.91).

As far as the Portuguese versions of PANAS are concerned, they were validated based on the same methodological assumptions adopted by the authors of the original version, although considering the peculiar characteristics that define affects, as well as lexical disparities, differences in context and culture [12, 46], showing good psychometric properties. Its translation was carried out by Galinha e Pais-Ribeiro [12], showing acceptable internal reliability values (αpositive affect = 0.86 and αnegative affect = 0.89) and an association between the two dimensions similar to the original scale (r = 0-0.10). The scale, in its reduced version, was developed by Galinha et al. [11], composed of the following items: positive affect – "enthusiastic", "inspired", "determined", "interested" and "active"; negative affect – "scared", "frightened", "tormented", "nervous" and "guilty". The two-factor model with 5 items each showed acceptable fit values (χ^2 = 43.7; gl = 34; CFI = 0.99; GFI = 0.96; RMSEA = 0.04), in a sample of 245 individuals aged between 19 and 57.

In view of the inconsistencies found in the different versions of the PANAS, Antunes el al. [32] validated a reduced version of the questionnaire in a sample of elderly people, which showed good model's fit to the data (i.e., S-B χ^2=68.96; df = 34; SRMR = 0.048; RMSEA = 0.058, 90% CI [0.038-0.077], TLI = 0.909; CFI = 0.932) which has been applied in various domains, such as physical activity [32], sport [13] and exercise [15].

Sports, affect, satisfaction with life and people with disabilities

Currently, the literature strongly supports the idea that physical activity has physical benefits [47, 48]. For people with disabilities, sports practice enhances the development of their abilities and potential, and they experience fun, pleasure and overcoming [49]. Although several authors have mentioned psychological benefits, such as well-being, research in this area is still limited related association with other psychological aspects associated with the self. However, it seems that physical activity increases positive emotional experiences and is positively correlated to satisfaction with life [50–52].

In elderly population the physical activity practice affect satisfaction with life mediated by affects measured at 1 and 5 years following enrolment in a 6-month randomized controlled trial [53]. In gym exercisers, the total of physical activity exercised in recent months seems to be inherently associated with affective response and adherence to practice [15]. Consequently, positive affect was positively associated with satisfaction with life, while negative affect showed a negative association [15]. The results of this study suggest the mediating role of affect between regular physical activity and perceived satisfaction with life, i.e. practitioners feel better about themselves, and their regular participation can be an important factor in maintaining positive affect and increasing satisfaction with life.

Being physically active has been associated with more positive affective experiences [54–56], increasing positive affect and showing a negative association with negative affect [57, 58]. In general, individuals with high levels of positive affect deal more effectively with mood states and achieve greater satisfaction with life. On the other hand, greater experience with negative affect is negatively associated with satisfaction with life [59, 60].

Despite these strong relationships, few studies have examined the association between physical activity practice, positive and negative affect, and life satisfaction in athletes with disabilities, particularly the possible mediating role of positive and negative affect in the relationship between the number of years of practice and satisfaction with life.

Current study

Study I

Although the scales have been translated and validated into several languages, including Portuguese, it has not yet been validated in sport for people with disabilities. The aim of this study was therefore to fill this gap by assessing the construct validity of Portuguese versions of SWLS and PANAS in this specific domain.

Study II

The aim of study II is to explore the possibility that cognitive processes and well-being mechanisms have an affective basis, influenced by regular physical activity [61]. We examined the relationship between years of regular sports practice and the affective response to behaviour and investigated the relationship with satisfaction with life in individuals with disabilities. Considering previous studies, we hypothesised that more frequent practitioners experience more positive affect [15, 56]. We also speculate that positive affect will have a positive relationship with satisfaction with life [15, 62, 63]. On the other hand, this greater frequency of practice will have a negative relationship with negative affect.

This study could contribute to understanding how years of sports practice are associated with well-being and satisfaction with life in individuals with disabilities, an also the theoretical assumption that the two dimensions of the model to not act as orthogonal, hypothesise that the emotional dimension directly influence the cognitive dimension (i.e., positive affect has a positive impact on life satisfaction, and negative affect has a negative impact).

Methods

Sample size calculations and participants

A priori sample size calculations for validation were conducted using the Soper Calculator [64] for structural equation modelling. The purpose of these calculations was to determine the optimal sample size required to adequately test the hypothesized factor structure of the measurement model. For SWLS factors such as the desired level of statistical power ($p = 0.9$), significance level ($p = 0.05$), latent variables (1), and the number of observed variables (5) were considered. Using the Soper Calculator, we ensured that the sample size was sufficient to achieve reliable and meaningful results, with a recommended of 100 participants to detect an effect. For PANAS, factors such as the desired statistical power ($p = 0.9$), significance level ($p = 0.05$), latent variables (1), and the number of observed variables (5) were considered. By using the Soper Calculator, we ensured that the sample size was sufficient to achieve reliable and meaningful results, with a recommended minimum of 119 participants to detect an effect. This rigorous approach to sample size determination enhances the validity and precision of the factor analysis, providing more accurate insights into the underlying structure of the variables being investigated [64, 65].

A total of 143 Portuguese athletes with disabilities (107 male and 36 female), aged 15 to 59 years ($M = 29.21$; $SD = 10.45$), participated in this study. These athletes were involved in various adapted sports, including wheelchair handball; athletics; cycling; wheelchair basketball; tricycle; canoeing; horse riding; football 7-a-side; goalball; judo; Greco-Roman wrestling; swimming; boccia; precision orientation; and rowing. Their years of practice ranged from 0 to 29 (M = 8.6; SD = 6.75). Overall, participants presented motor, sensory (visual and hearing), and/or cerebral paralysis disabilities.

To be included, participants had to be registered with the International Paralympic Committee and have participated in formal or international competitive sports within the last six months. Participants who did not agree to participate in the study, who did not give informed consent or who did not complete the instruments in full were excluded.

Data collection procedures

Data collection adhered to the principles outlined in the Helsinki Declaration [66]. This is a cross-sectional study involving Portuguese athletes with disabilities. The questionnaires were presented with a cover letter explaining the aims of the study and identifying the authors, collaborators and partners, in which the principle of confidentiality was preserved. All the athletes were contacted individually at the training centre, internship or specific situations at the competition centre, where, in addition to explaining the aims of the study, they were asked to give their informed consent by signing it (i.e. free and informed consent for their data to be used anonymously), respecting the ethical principles of research of this nature (mainly in terms of respect for the dignity and rights of people with disabilities, social, professional and scientific responsibility, beneficence and non-maleficence, confidentiality, among others). It should be emphasised that the social network (Facebook) was used to ask athletes to collaborate when they were on long training periods, out of the country for international competitions or, in the specific case of some hearing-impaired athletes, because they didn't speak Portuguese Sign Language. Eleven athletes were involved in this situation (four of whom were hearing impaired). Data collection lasted around 12 months, with all the athletes invited agreeing to take part in the study. The time required to fill in the questionnaires ranged from 15 to 45 min.

Instruments

The Portuguese version of the SWLS [31] also validated by Antunes et al. [32], was employed to assess athletes' overall cognitive evaluation of life satisfaction. Participants were asked to indicate their level of agreement with each of the five statements in the measure. Responses were scored on a seven-point scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). In the Portuguese translation, the neutral or mid-scale category is labelled as "Neutral." The items were subsequently combined into a single factor represented as satisfaction with life (Cronbach's alpha = 0.82), aligning with the cognitive perspective outlined by Diener et al. [9].

The PANAS contains of 20 items, answered on a Likert scale ranging from 1 ("Not at all or very slightly") to 5 ("Extremely") [67]. A validated Portuguese short version by Galinha et al. [11], and also by Antunes et al. [32], which includes two factors (five items each), was used. These factors represent positive and negative affect.

Athletes Sports Experience was measure by the numbers of years practice.

Statistical analysis

Descriptive statistics, such as means and standard deviations, along with bivariate correlations, were computed for all variables examined (positive and negative affect, satisfaction with life, and years of practice). Study 1 utilized Confirmatory Factor Analysis (CFA), while Study 2 involved Structural Equation Modeling (SEM) and mediation analysis.

Study 1

Confirmatory factor analysis

CFA, using the Full Information Maximum Likelihood method and covariance matrix in AMOS version 29

(IBM Corp), adhere to suggestions by various authors [68, 69]. The aims were to assess the goodness-of-fit of the model using the following indices: the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Standardized Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA), with its matching 90% confidence interval. To complete adequate fit, the cutoff values were set a CFI and TLI ≥ 0.90, SRMR and RMSEA ≤ 0.08 [68–70]. Our study had less than 5% missing data, which were randomly distributed across the dataset. To attend this topic, Full Information Maximum Likelihood (FIML) imputation was employed [71]. Convergent validity was measured using the Average Variance Extracted (AVE), where values equal to or greater than 0.50 are deemed acceptable [68]. Discriminant validity was confirmed if the AVE of each construct exceeded the squared correlations between all factors in the model [68]. Lastly, the internal consistency of each subscale was evaluated using composite reliability (CR), calculated using Raykov's formula [72]. Values of 0.70 or greater indicate strong composite reliability.

Study 2

Structural equation modelling

The hypothesized model was analysed using Structural Equation Modelling with a two-step maximum likelihood approach, following Kline's recommendations [73], implemented in IBM SPSS Amos v.29. Initially, CFA was performed to examine the psychometric properties of the proposed model. Internal consistency was assessed using CR calculated with Raykov's formula [72], with a cut-off value set at 0.70 [68]. Convergent validity was evaluated by calculating the AVE [68]. Discriminant validity was confirmed if the correlation coefficients were lower than the AVE for each construct and exceeded the squared correlations with any other construct [74]. Subsequently, SEM was used to investigate the hypothesized relationships among various constructs. Standardized direct and indirect effects on the outcome variable were evaluated, with significance determined by 95% Confidence Intervals (CI) that did not include zero [75]. Bootstrap resampling (1000 samples) with a bias corrected 95%CI was employed to verify the significance of these effects. For both CFA and SEM, a range of absolute and incremental indices were utilized for analysis: CFI, TLI, SRMR, and RMSEA along with its 90% CI. Acceptable scores were defined as CFI and TLI ≥ 0.90, and SRMR and RMSEA ≤ 0.08, aligning with recommendations from several authors [68–70].

Mediation analysis

To assess the proposed interactions, a parallel mediation analysis based on Hayes's model 4 recommendations [76] was performed using SPSS PROCESS v.4.2. This method enables the estimation of direct and indirect effects within the proposed models, controlling for the influence of *k* mediators between variables [76]. In examining the interaction between independent and dependent variables, bias-corrected bootstrapped point estimates were computed, considering standard errors and a 95% confidence interval. A bootstrap resampling of 5000 samples was applied in line with recommendations from multiple authors [75, 76], considering indirect effects as significant when the confidence interval excludes zero ($\alpha = 0.05$).

Results

Study I

Satisfaction with life scale

Descriptive statistics The descriptive statistics for the 5 items of the scale indicate a good dispersion of responses from students, ensuring responses across various points of the Likert scale used. The standard deviation is close to one, reflecting variability in responses. The mean values of the scale items are all above the midpoint of the scale, suggesting a positive or optimistic trend in the self-assessments of the sample participants regarding the consistency of their goals. The absolute values of skewness and kurtosis were ≤ 1, indicating that the univariate normality of all items, across all groups, was within an acceptable range for applying maximum likelihood estimation in confirmatory factor analysis [77]. The items were considered normally distributed variables, with skewness less than 2 and kurtosis less than 7. Table 1 showing the descriptive statistics for the scale results.

Internal consistency

The reliability analysis of the SWLS indicated an internal consistency of 0.823 (Cronbach's alpha), demonstrating strong internal consistency well above the 0.70

Table 1 Descriptive statistics of the satisfaction with life scale

Items	Min	Max	M	SD	Skew	Kurtosis
1	2	7	5.13	1.22	−0.42	−0.11
2	1	7	4.85	1.34	−0.43	−0.13
3	1	7	5.44	1.14	−0.70	1.19
4	2	7	5.69	1.07	−0.60	0.41
5	1	7	4.92	1.61	−0.46	−0.52

Note: Min, minimum; Max, maximum; M, Means; SD, Standard Deviations

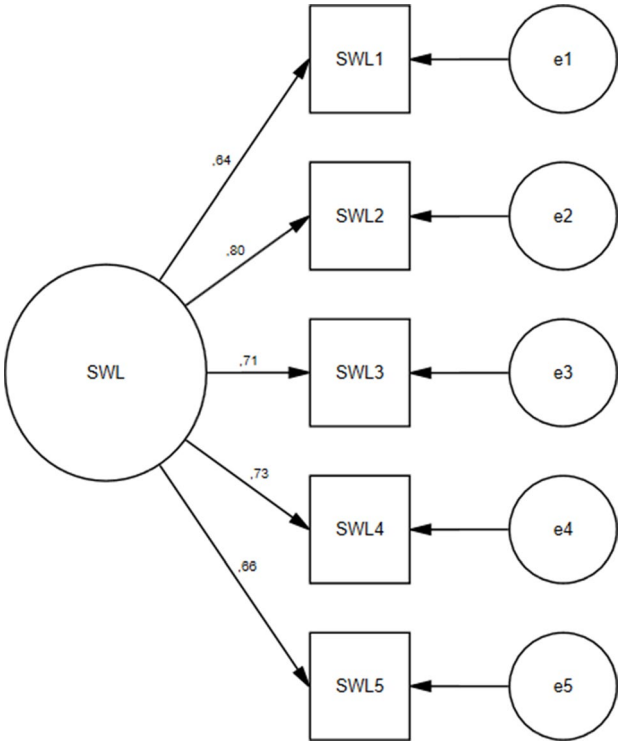

Fig. 1 Standardized factor loading of the model (SWLS)

threshold. Given this sufficient alpha value, no indicators were excluded. This level of Cronbach's alpha is consistent with values reported in various studies, ranging from 0.82 to 0.87 [30].

Confirmatory factor analysis

The results of this analysis suggest that there is a moderate to strong correlation among the five SWLS indicators. The minimum correlation between the indicators is 0.40, and the maximum is 0.57, which is considered adequate to proceed with factor analysis [68]. All items in the measurement model exhibited factor loadings of 0.50 or higher, indicating that they explained at least 25% of the variance in their respective latent factors. The five SWLS indicators combine into one factor. Factor loadings range from 0.64 to 0.80. actor loadings above 0.40 are considered significant and were included in the scale [68]. Figure 1 indicates the results of the factor analysis.

The measurement model was evaluated for its fit to the data, demonstrating a good fit with the following results: [$\chi 2/df = 6.3$, B-S $p = 0.487$, TLI = 0.989, CFI = 0.995, SRMR = 0.0263, RMSEA = 0.043 (CI = 0, 0.130)]. These results indicate an acceptable fit, with incremental indices exceeding the 0.90 threshold and absolute indices below the 0.08 threshold. These findings support the adequacy and validity of the measurement model in capturing the intended constructs and their relationships within the observed data. The unidimensionality of the 5-item SWLS was confirmed.

Table 2 Composite reliability, convergent and discriminant validity

Latent variables	CR	AVE	1	2	r^2
PANAS – Positive Affect	76	0.38	1	−0.15	0.02
PANAS – Negative Affect	80	0.45	−0.15	1	-

Notes: CR = Composite reliability; AVE = Average variance extracted; below the diagonal line are reported the squared correlations

PANAS

Descriptive statistics of PANAS items

Table 2 shows that participants responded across all levels (i.e., between 1 and 5), with higher averages for items related to positive affect. Additionally, values on the positive scale are left-skewed, while values on the negative scale are right-skewed. The mean scores and standard deviations for each item on the SWLS are presented in Table 3.

Internal consistency

The analysis of the reliability of the SWLS showed an internal consistency (Cronbach's alpha) acceptable for both factors (αpositive affect = 0.75; αnegative affect = 0.80), which is well above the 0.70 threshold.

Table 3 Descriptive analysis of PANAS items

Items	Min	Max	M	SD	Skew	Kurtosis
1 (PA)	1	5	4.08	0.75	−0.84	1.58
2 (NA)	1	5	1.52	0.89	1.73	2.57
6 (NA)	1	5	1.56	0.97	1.66	2.25
7 (NA)	1	5	1.50	0.89	1.91	3.22
10 (PA)	1	5	4.03	0.75	−0.66	1.06
15 (NA)	1	5	3.76	0.91	−0.42	−0.04
16 (PA)	1	5	2.36	1.18	0.62	−0.52
17 (PA)	1	5	4.13	1.00	-1.25	1.46
19 (PA)	1	5	4.02	0.93	−0.89	0.81
20 (NA)	1	5	1.75	0.99	1.37	1.40

Note: PA, positive affect; NA, negative affect; Min, minimum; Max, maximum; M, Mean; SD, Standard Deviations

Since the alpha value is sufficient, no indicators are excluded.

Confirmatory factor analysis

All items in the model measurement scales exhibited factor loadings of 0.50 or higher, indicating that they accounted for at least 25% of the variance in their respective latent factors. The five PANAS indicators combine into two factors, with non-significant correlations between them. Factor loadings range from 0.52 to 0.73, with positive affect loadings between 0.52 and 0.67 and negative affect loadings between 0.63 and 0.73. Factor loadings above 0.40 are considered significant and were included in the scale [68]. Figure 2 displays the results of the factor analysis.

The measurement model was evaluated for its fit to the data, showing good fit: [$\chi 2/df = 1.871$, B-S $p = 0.114$, TLI = 0.891, CFI = 0.918, SRMR = 0.0778, RMSEA = 0.078 (CI = 0.048, 0.108)]. The results suggest an acceptable fit, with incremental indices approaching the threshold of 0.90 and absolute indices below 0.08. the adequacy and validity of the measurement model in capturing the intended constructs and their relationships within the observed data was supported by the results of this study. Furthermore, the RMSEA (range from 0 to 0.077) indicated a good fit for the modified single-factor structure of SWLS across all seven groups.

The CR scores for all subscales bested the recommended threshold (CR > 0.70) in both scales, suggesting satisfactory internal consistency and suggesting that the items effectively measure the constructs. Regarding

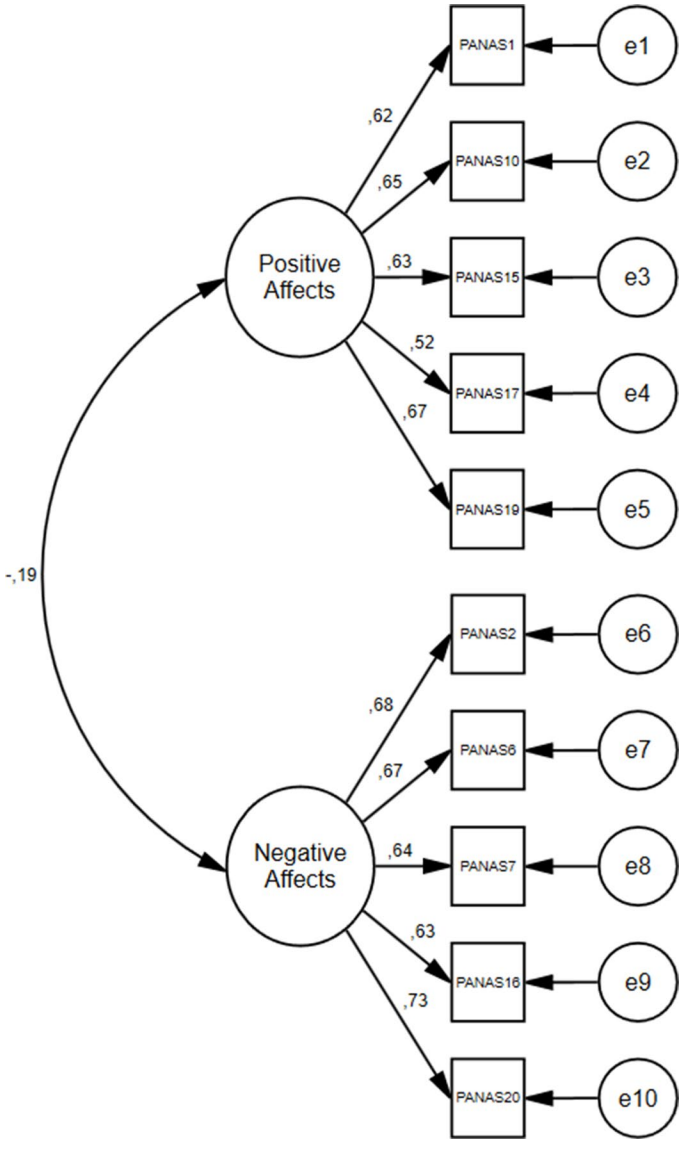

Fig. 2 Standardized Factor Loading of the model (PANAS)

convergent validity, the results reveal some weaknesses as the values are lower than the recommended thresholds. At the same time, the scale exhibited adequate discriminant validity, as indicated by squared correlations between factors that were lower than the AVE.

Study II

Table 4 show the mean for positive affect was higher than for negative affect. The mean scores for satisfaction with life were above the middle point.

Symmetry and kurtosis values were within acceptable limits, indicating a normal distribution. The composite reliability coefficient was above the appropriate threshold (>0.70), demonstrating acceptable internal consistency. Analysing the correlations of the latent variables revealed the following: (i) years of practice had a significant association with positive affect, and (ii) positive affect had a significant association with satisfaction with life.

The measurement model provided an acceptable fit to the data [$\chi 2/df = 1.436$, B-S $p = 0.269$, TLI = 0.917, CFI = 0.930, SRMR = 0.0748, RMSEA = 0.055 (CI = 0.033, 0.075)] (Fig. 3).

Years of practice exhibits positive associations with positive affect ($r = 0.258$). Moreover, positive affect is positively linked to SWLS ($r = 0.283$). The standardized indirect effects between years of practice and SWLS through positive affect are positive and significant ($\beta = 0.073$, CI = 0.020, 0.139; $p = 0.031$). For details see Fig. 4.

Discussion

SWLS

This scale is a brief measure satisfaction with life validated and widely used in a variety of samples and languages across countries. Results from the analysis indicate that the Portuguese version of the SWLS is a reliable measure of satisfaction with life in the people with disabilities context.

The scale's internal consistency in this study showed an acceptable reliability, producing an alpha equal to 0.82, meeting acceptable measurement standards, results higher than those found for the Spanish population with disabilities [78]. Our results are also similar to those seen in other clinical samples, such as individuals with Parkison's disease [79], lupus [80], multiple sclerosis [81] or psychiatry and medical outpatients [82].

The exploratory factor analysis of the SWLS in Portuguese with disabilities presented a satisfactory one-factor structure, with factor weights ranging from 0.64 to 0.80, similarly with other studies. All SWLS items exhibited high factor loadings (the lowest being 0.64) and corrected item-total correlations (the lowest being 0.40). These findings align with the factor analysis conducted by Diener et al. [9] during the development of the original instrument, which yielded factor loadings ranging from 0.61 to 0.84, a pattern replicated in multiple studies [9, 20, 30, 37]. As highlighted in previous research, the replication of our study's findings across various countries and languages underscores the scale's validity in the Portuguese with disabilities sample. Unlike other studies where item 5 typically shows the lowest factor loading, our study identified item 1 as having the lowest factor loading 1 [83].

For this Portuguese with disabilities sample, the results show that the scale has good internal consistency and favourable factor validity, and the results are like those found in the original study, and studies using the SWLS in diverse languages and populations samples. Among others, the present study shows similar results as those validated in university students and older adults [9, 29], to results in different countries that used the original scale in English, or translated it to other languages [37, 83–85], where high internal consistency was found within ranges between 0.79 and 0.80 (Cronbach's alpha).

PANAS

The results provided evidence that the Portuguese version of the PANAS is psychometrically acceptable for assessing this specific population.

The scale's internal consistency in this study showed an acceptable reliability, producing an alpha equal to 0.75 for positive affect and 0.80 for negative affect. Our results are consistent with the figures for other clinical samples with anxiety, depressive, and adjustment disorders [86].

The factor weights varied between 0.52 and 0.73. All the PANAS items presented higher factor loadings (the lowest was 0.52), supporting the psychometric properties of the scale's validation in Portuguese [11]. The CFA for PA and NA at the item level indicated that most of the items present adequate factor loadings. The results of our study are in line with previous studies [46, 87, 88], emphasizing the idea of the independence of positive and

Table 4 Descriptive statistics, composite reliability coefficients and latent correlations

Variable	M	SD	Range	Skew	Kurtosis	CR	1	2	3	4
1. Years of practice	8.6	6.75	0–29	0.89	−0.06	-	1	-	-	-
2. Positive Affect	4.01	0.62	2.40-5	−0.26	−0.71	0.76	0.26*	1	-	-
3. Negative Affect	1.74	0.72	1–5	1.58	3.89	0.81	−0.12	−0.15	1	-
4. SWLS	5.21	0.99	3–7	−0.05	−0.59	0.84	−0.05	0.25*	0.02	1

Note: M, Means; SD, Standard Deviations; CR, Composite Reliability *, $p \leq 0.05$

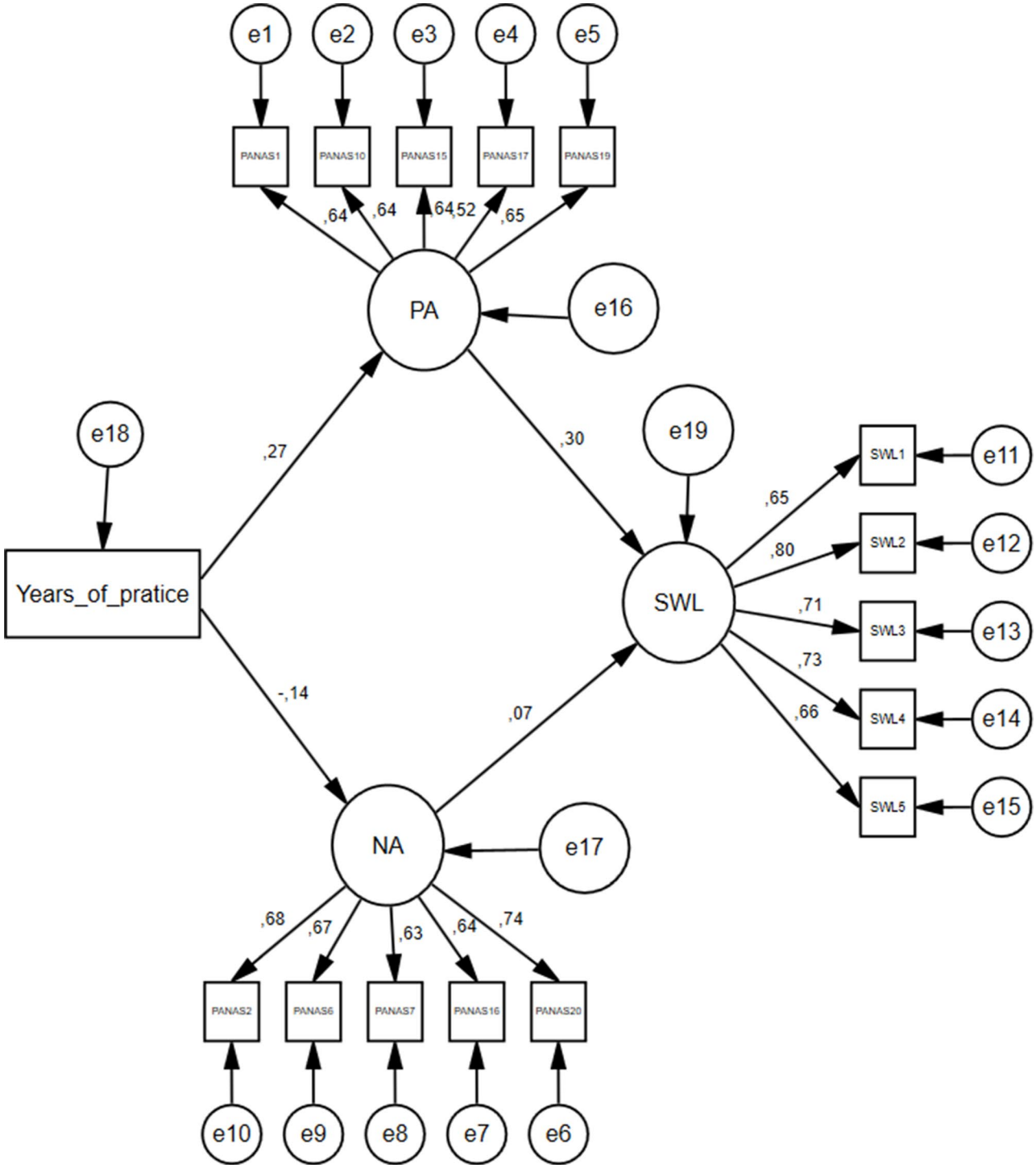

Fig. 3 Structural model

negative affect also in the Portuguese population with disabilities.

Interpreting the internal consistency values from the composite reliability indicator (taking into account the recommendations by Hair et al. [67]), suggest that items from both factors (i.e., positive and negative affect) are likewise and simultaneously measuring the constructs. Concerning convergent validity, the results indicate that the correlation between the items and their respective factors is weaker than desired, with values falling below the recommended threshold [68]. Nevertheless, the results demonstrate discriminant validity, indicating that

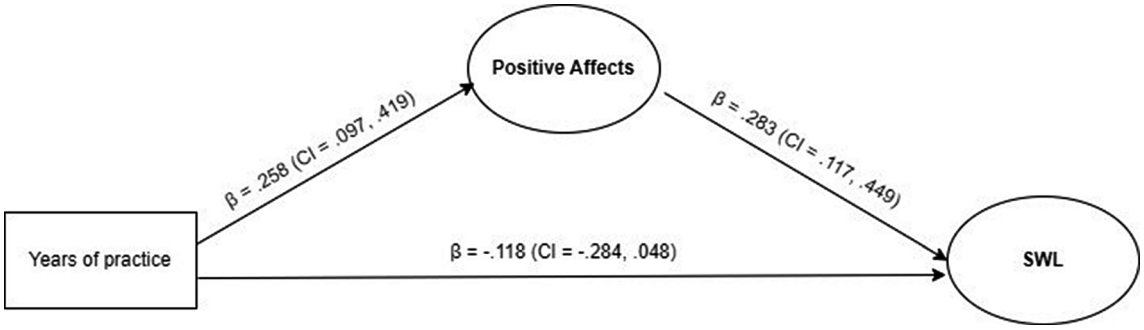

Fig. 4 Mediation model

the constructs (i.e., positive and negative affect) are sufficiently independent of each other [89, 90].

For this Portuguese with disabilities sample, the results show that the scale has good internal consistency and favourable factor validity, and the results are like those found in the original study, and studies using the PANAS in diverse languages and populations samples.

Structural equation and mediation model

Given the lack of studies examining the relationship between physical activity and the affective response associated with well-being indicators, the aim of study II was to examine a hypothetical model according to which years of physical activity are related to affect, which is unequally related to satisfaction with life. The proposed model fits the data. According to our results, years of physical activity are significantly and positively associated with positive affect. In turn, positive affect is significantly associated with satisfaction with life. These results were not verified for negative effects.

Our results corroborate previous studies in which the practice of physical activity positively impacts positive affect and, in turn, satisfaction with life [15, 91]. These results are like those found by Magnan et al. [56], where regular physical activity and affective response appear to be associated. It seems that for those who practise physical activity to feel higher levels of affects, they will have to practise for more years.

Regarding the non-significant association between years of practice and negative affects, this can be explained by the context since practice is a choice and practitioners don't feel or experience negative effects. This result makes perfect sense, given that athletes perceive high levels of satisfaction with life and positive affect, they would not be able to feel negative affect from the outset. Relative to the non-significant association between years of practice and negative affect, this can be explained by the context since practice is a choice and practitioners do not feel or experience negative affect. However, this result makes perfect sense, given that athletes perceive high levels of satisfaction with life and positive affects, they wouldn't feel negative affects.

For physical activity participants to feel higher levels of positive affect, they need to exercise regularly for more years. Trainers or exercise coaches should promote the regular practice of physical activity so that exercisers exhibit high levels of pleasure affect, to the detriment of displeasure affect.

The results of our study also suggest that positive affect may play a mediating role between years of practice and satisfaction with life, i.e., those who have been practising for longer experience adaptive affective states, resulting in higher perceptions of satisfaction with life. Therefore, trainers and exercise coaches should interact with participants in such a way that they feel positive affective responses towards the practice of physical activity.

Limitations and future research

As far as we know, this is the first study to evaluate the psychometric properties of the SWLS and PANAS in a Portuguese disabled population. Despite this, there are some limitations that should be mentioned. The sample recruited was one of convenience. The cross-sectional design of the study does not allow us to examine causal relationships between satisfaction with life and other variables. Reliability indices were not calculated using the test-retest methodology but only simultaneously using Cronbach's Alpha Index. Although the sample size expressed the statistical requirements, studies with a larger number of participants are needed. In this sense, longitudinal studies are needed to confirm the effects of the variables studied (e.g., over the duration of a sports season and/or during a Paralympic event). Similarly, future studies should also calculate the invariance of the factors for sub-samples, namely sex, type of disability or type of sport practice, for both scales. Finally, this study was carried out in Portugal and its results cannot be generalised to other cultures and contexts.

Conclusion

This validation study of the SWLS and PANAS in a representative sample of Portuguese people with disabilities concluded that the scales demonstrate internal consistency, favourable factorial validity, and acceptable criterion validity.

These findings validate the SWLS and PANAS as reliable measures of the cognitive-judgment component of subjective well-being. Researchers can confidently use the Portuguese versions of these scales to assess life satisfaction and affect in Portuguese individuals with disabilities.

Given the important role of satisfaction with life and affect in overall psychological well-being, we endorse previous research that emphasizes the importance of health systems focusing not only on illness and disability but also on methods to enhance positive psychological states.

On the other hand, regular physical activity, specifically years of practice, appears to be intrinsically linked to the affective response to physical activity. As a result, positive affect is positively correlated with life satisfaction. This provides empirical evidence supporting the hypothesis that longer participation in sports may be a key factor in maintaining positive affect and, consequently, enhancing life satisfaction.

Abbreviations

AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CI	Confidence Intervals
CR	composite reliability
Df	Degrees of freedom
FIML	Full Information Maximum Likelihood
M	mean
NFI	Normed fit index
PANAS	Positive and Negative Affect Schedule
r	correlation
RMSEA	Root Mean Square Error of Approximation
SD	standard deviation
SEM	Structural Equation Modeling
SRMR	Standardized Root Mean Square Residual
SWLS	Satisfaction With Life Scale

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Author contributions

Conceptualization, M.J., N.C., D.M., R.A. and L.C.; methodology, M.J., N.C., D.M., R.A. and L.C.; software, M.J.; validation, N.C., D.M., R.A. and L.C.; formal analysis, N.C., A.V., T.B., R.M., D.M., N.A., R.A. and L.C.; investigation, M.J. and L: C.; resources, M.J. and L.C.; data curation, M.J., N.C., A.V., T.B., R.M., D.M., N.A., R.A. and L.C.; writing—original draft preparation, M.J., N.C., D.M., R.A. and L.C.; writing—review and editing, N.C., A.V., T.B., R.M. and N.A.; visualization, N.C., A.V., T.B., R.M., and N.A.; supervision, D.M. and L.C.; project administration, D.M. and L.C; funding acquisition, M.J., N.C., A.V., T.B., R.M., D.M., N.A., R.A. and L.C.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Data collection adhered to the principles outlined in the Helsinki Declaration. The study was approved by an ethics committee of the University of Beira Interior under the code CE-UBI-Pj-2018-076. Informed consent was obtained from all subjects involved in the study. Written informed consent has been obtained from the patient(s) to publish this paper.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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