Impact of the Basic Psychological Needs in Subjective Happiness, Subjective Vitality and Physical Activity in an Elderly Portuguese Population

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ABSTRACT

The goal of this work is to analyze the impact of elderly Portuguese individuals' global perception of satisfying basic psychological needs in the areas of subjective happiness, subjective vitality and physical activity through a structural equations model. The way of well-being differs according to the amount of physical activity practiced in Portuguese elderly was also analyzed. Participants included 309 elderly people (242 females, 67 males) of Portuguese nationality who practice different levels of physical activity. Their ages range from 60 to 90 years old (M=68.59; DP=6.60).
The obtained results show that the perception of basic psychological needs in Portuguese elderly people's lives are a positive predictor of subjective happiness and subjective vitality. Also, the results verified that elderly people who perceive higher levels of competence practice more physical activity. Consequently, it is also possible to conclude that elderly people who participate in more physical activities perceive greater levels of subjective happiness and subjective vitality.
Key words: elderly people, well-being, physical activity, basic psychological needs.

INTRODUCTION

As is known, the average life expectancy has been increasing, which leads researchers to be concerned about the way people in advanced phases of life can live without health problems (Ferrand, Martinent, & Durmaz, 2014). Because of this, research has shown that physical activity is essential to elderly people's quality of life (Franchi & Montenegro, 2005), since it contributes to the maintenance of their daily activities, and it also contributes to the prevention of diseases that usually occur with the aging process (National Institute on Aging [NIA], 2010). Thus, physical exercise can inclusively promote the elderlies' well-being in general (Biddle & Ekekkakis, 2005).

Diener and Lucas (1999) defined subjective well-being by the evaluation people make of their own lives. Diener (1994) also interpreted this to mean an experience characterized by the presence of positive affections, reduced presence of negative affections and high levels of life satisfaction. According to Neri (2004), subjective well-being in elderly populations is known as the capacity that an individual has to come with compensatory mechanisms, such as work and involvement in groups of social activities, leaving the prejudice that defines elderly people as unhappy and lonely. This understanding suggests that experiences of well-being are strongly influenced by self-qualities and socio-cognitive variables, which links well-being to the social condition where elderly people live (Neto, Lima, Gomes, Santos, & Tolentino, 2012).

Subjective well-being focuses on happiness by maximizing pleasure and minimizing pain, considering happiness to be the total of moments lived with pleasure, all of which are the main characteristics of well-being from the hedonic perspective (Ryan, Huta, & Deci, 2008).

Nevertheless, the eudemonic perspective also has room in its definition for well-being, in that such is intimately related to an individual's optimal functioning (Ryan & Deci, 2001, 2008).

This well-being conceptualization affirms this is not only a result or a final state, but an accomplishment, or a state of one's *Daimon* (Ryan & Deci, 2001, 2008). Ryff (1989) interpreted the term *Daimon* as an ideal in terms of excellence and perfection, a state of being in which an individual is willing to fight for something, which means the person has a direction in his or her life, thus it is centered on the eudemonic perspective in psychological well-being, which is characterized by an individual's optimal functioning (Ryan & Deci, 2001).

Deci & Ryan, (2000) explained Self-Determination Theory (SDT) saying that self-achievement is the main aspect of well-being and it explains how basic psychological need (BPN) satisfaction is important to psychological development (e.g., intrinsic motivation), integrity (e.g., internalization and assimilation of cultural practices), well-being (e.g., psychological health), as well as a perception of vitality, which psychologists have conceptually interpreted as one's conscientious experience of energy and one's possessing a sense of vivacity (Ryan & Deci, 2001; Ryan & Frederick, 1997).

In this way, Ryan and Deci (2002) explained the basic psychological needs theory, which is one of the mini theories integrated into SDT, such that BPN consists of autonomy (i.e., an individual's capacity to regulate his own actions), competence (i.e., an individual's capacity of efficacy in interaction with the involvement), and relatedness (i.e., an individual's capacity to look for and develop interpersonal connections and relationships), and that these have an essential role in an individual's daily life because they are essential conditions to the great functioning of one's natural dispositions. That is, autonomy, competence, and relatedness are needed for the growth and integration of one's personality and cognitive structures, as well as of one's social development and personal well-being (Ryan & Deci, 2000a, 2002). Thus, an individual with a high amount of BPN of autonomy, competence, and relatedness will be an individual who is constantly active in the search of his or her own satisfaction (Ryan & Deci, 2000b).

Some researchers have diversified BPN satisfaction in terms of behaviour variance, based on influences from an individual's personal relationships or integration contexts (La Guardia & Patrick, 2008), thus one's motivational function is ideally reached with one's overall satisfaction with all aspects of their life (Ryan & Deci, 2007). Deci and Ryan's (2000) investigation showed that the higher one's perception of BPN satisfaction, the more self-determined (more autonomous) is the behaviour, which is intimately related with well-being. On the other hand, the lower the BPN satisfaction, the less self-determined (more controlled) is the behaviour, which predicts lower levels of well-being (Deci, Koestner, & Ryan, 1999). Ryan and Deci (2001) also explained that when an activity promotes an autonomous behaviour, it simultaneous provides subjective happiness and subjective vitality, which are characteristics of subjective well-being and psychological well-being, respectively.

Vallerand, O'Connor, and Hamel (1995), from studying motivation in an elderly population, affirmed that this theme is extremely important in this population: first, because this process helps us to understand the factors that regulate the behaviour in elderly people; second, because changes associated with aging involve the perception of incompetence or feelings that reduce the self-determination of the behaviour; third, the comprehension of motivation is necessary to understand the psychological process in aging and the factors that influence health in this life phase; lastly, the authors affirm that understanding elderly populations' motivation allows us to structure contexts where these interact, in order to potentiate motivation in individuals' lives.

This last point is essential, since the context where the individual is situated mediates his or her actions (Kirkland, Karlin, Stelino, & Pulos, 2011), positively contributing to BNP satisfaction, and when the individual realizes his or her satisfaction, he or she tends to begin to maintain a variety of behaviours (Losier, Bourque, & Vallerand, 1993; Vallerand & Losier,

1999), which tendency makes it possible to include the practice of physical activity, among other things.

As mentioned before, physical activity may be the vehicle to increase well-being to those who practice it (Biddle & Ekkekakis, 2005). Nevertheless, epidemiologic studies have been showing that the practice of physical activity decreases with aging (Hallal et al, 2012; Sun, Norman, & While, 2013). Furthermore, for those who maintain active life styles over time, it is not the fact of being active that leads them to get positive results from the practice, since, according to Chodzko-Zajko et al. (2009), being physically active is better than not being so; however, individuals need to follow certain parameters, as the majority of positive results to health are amplified with the increase of intensity, frequency and duration of the practice of physical activity. In a study about subjective well-being and physical activity in elderly individuals, Neto et al. (2012) concluded that active elderly people have a greater perception of subjective well-being than do the sedentary elderly. Nonetheless, individuals who practice physical activity four to five times a week present higher values of subjective well-being. Withall et al. (2014) also confirmed the existence of positive links between the amount of physical activity with moderate and vigorous intensity and the perception of well-being in elderly individuals. Solberg, Halvari, Ommundsen, and Hopkins (2014) tested several training types (i.e., endurance, functional, strength) in a four-month program in an elderly population, concluding that every type of training enhanced the evaluated well-being dimensions.

In short, if we take into account: i) a low adherence to physical activity behaviour all over the world (Hallal et al., 2012), which assumes particular relevance in the European elderly population (European Comission, 2010; European Comission, 2014a), which makes this question even more worrying if we consider demographic projections for the next decades which show an overall aging of the population (European Comission, 2014b); ii) the clear and unquestionable benefits of physical activity in health and well-being (WHO, 2015), on non-

transmissible diseases prevention (Lee et al., 2012) and on well-being (Withall et al., 2014) iii) that behaviour regulation plays an important role as a determinate of a physically active life (Ferrand, Nasarre, Hautier, & Bonnefoy, 2012); iv) that the satisfaction of basic psychological needs has a significant and positive impact on well-being, (Moutão, Alves, Monteiro, & Cid, 2015), and iv) little is known about its motivational determinants in elderly population, in particular in non-clinic populations, in the present study, in the hypothesizes casual model (Figure 1) we initially analyzed the impact of an elderly population's global perception of BPN satisfaction (underlying to SDT) in their daily lives, looking at subjective happiness and subjective vitality (i.e., well-being variables), on the practice of physical activity (PA) in Portuguese elderly individuals. In the second place, we analyzed how well-being may differ according to the amount of physical activity the Portuguese elderly individuals practiced.
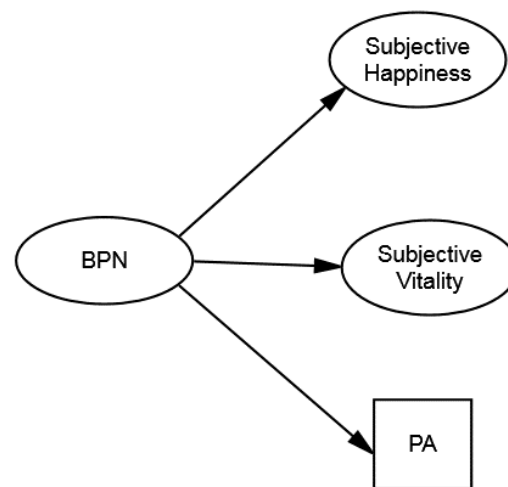

Figura 1. Hypothesized Causal Model

METHODOLOGY

Participants

Three hundred nine elderly people (242 females, 67 males) of Portuguese nationality participated in this study. The participants frequented senior universities and nursing homes (none of them were institutionalized), were residents in Ribatejo and in the West Area of continental Portugal, were aged between 60 and 90 years old (M= 68.59; DP = 6.60), and they had regular practice of physical activity (among

the reported activities, maintenance gymnastics, aerobic, hydro-gymnastics, and walking are those that stand out the most).

Instruments

The *General Need Satisfaction Scale* (BNSG-S: Gagné, 2003), validated to the elderly Portuguese population by Couto et al. (submitted), enables the evaluation of BPN global satisfaction in Portuguese elderly people's lives. This questionnaire consisted of 11 items answered on a Likert-type scale of 7 levels, whose answers varied between 1 ("totally disagree") and 7 ("totally agree"). We posteriorly grouped the items into three factors (i.e. autonomy, 3 items; competence, 3 items; relatedness, 5 items), reflecting the basic psychological needs underlying the SDT (Deci & Ryan, 1985). Afterwards, we calculated the score using the sum of the items, and previously, we calculated it by inverting the negative items.

The *Subjective Happiness Scale* (SHS: Lyubomirsky & Lepper, 1999), validated to the elderly Portuguese population by Couto et al. (submitted), enables the assessment of subjective happiness in the elderly Portuguese population. SHS consists of three items answered on a Likert-type scale with seven answer possibilities. We calculated the subjective happiness value by averaging the individuals' answers.

The *Subjective Vitality Scale* (SVS: Ryan & Frederick, 1997), validated to Portuguese exercisers (Moutão, Alves, & Cid, 2013) and Portuguese elderly population (Couto et al., submitted), enables the assessment of subjective vitality in the elderly Portuguese population. It consists of 6 items that make up a single factor that measures subjective vitality, with seven answer possibilities on a Likert-type scale, which vary between 1 ("totally disagree") and 7 ("totally agree"). We calculated the subjective vitality value by averaging the individuals' answers.

The *International Physical Activity Questionnaire* (IPAQ), validated to 12 countries including Portugal (Craig et al., 2003), enables the quantification of the practice of physical activity in daily life. Psychologists use this questionnaire, which consists of 4 questions, to evaluate individuals' weekly physical activity in walking,

moderate activities, and vigorous activities. IPAQ categorizes physical activity according to the frequency and duration of each specific type of activity, and also by the time spent seated each day in a week. We converted the data we obtained data from IPAQ to MET-min/week (metabolic equivalent) by calculating the marked minutes a week in each category of activities by the specific metabolic equivalent. We then classified each individual's physical activity level based on IPAQ's recommendations, into the following categories of physical activity:

Category 1 (Low): The lowest physical activity level corresponds with individuals who did not fulfil the criteria for categories 2 or 3. IPAQ considers these individuals inactive.

Category 2 (Moderate): corresponds with individuals who met one of the following criteria: a) participated in 3 or more days of vigorous physical activity for at least 20 minutes a day; b) participated in 5 or more days of moderate physical activity and/or walking for at least 30 minute a day; c) participated in 5 or more days of any combination of walking, moderate, or vigorous physical activity, and reached a minimum total physical activity of at least 600 MET-minutes/week.

Category 3 (High): consists of individuals who met one of the following criteria: a) participated in vigorous activity for at least 3 days per week, reaching a minimum total of physical activity of 1500 MET-minutes/week; b) participated 7 days a week in any combination of walking and moderate or vigorous activities and reached a minimum total physical activity of at least 3,000 MET-minutes/week.

Procedures
Data Collection Procedures

The study has a cross-sectional design, being the data collected in a single moment and by convenience. After we received the practitioners' informed consent signatures by way of contacting the heads of the senior universities and the nursing homes, we collected and analyzed all data, leaving the participants anonymous. Proctors collected the data in a classroom context in functioning local senior universities, where the participants were in small groups (maximum of

20 people). Participants took about 20 minutes to complete the forms.

The ethics commission of Regional Health Administration from Lisbon and Tejo's Valley (ARSLVT in Portuguese): Judgment 129/CES/INV/2013 from Ethics Commission approved the present work, which belongs to a larger study that they approved in totality.

Data Analysis Procedures

We used structural equations models (SEM), which involve a multivariate technique that allows users to simultaneously examine relationships between latent constructs and measurement variables, such as between several model constructs (Hair, Black, Babin, & Anderson, 2014). Some see this type of analysis as a fusion of two techniques: regression analysis and factorial analyses. While regression analysis (also known as path analysis) focuses on hypothetical causal relationships within variables, factorial analysis focuses on finding a group of factors that explain the common variance within an item's group (Biddle, Markland, Gilbourne, Chatzisarantis, & Sparkes, 2001). In this manner, in the present study, the influence of autonomy, competence and relatedness on the well-being and physical activity of the elderly was tested from the BNP model underlying SDT (Deci & Ryan, 1985).

In operational terms, SEM was made from AMOS 21 software, underlying the guidelines from several authors (Byrne, 2010; Hair et al., 2014; Worthington & Whittaker, 2006). We used the maximum likelihood (ML) estimation method through a chi-square (χ^2) test with the respective degrees of freedom (df) and significance level (p). Additionally, we also used the following indexes of adjustment quality: Standardized Root Mean Square Residual (SRMR), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA) and the respective confidence interval (90% CI). In the current study, we adopted the cut-off values that Hu and Bentler (1999) suggested: SRMR ≤ .08, CFI e TLI ≥ .95 e RMSEA ≤ .06. However, we also took the advice from several authors (e.g., Byrne, 2010; Hair et al., 2014; Marsh, Hau, & Wen, 2004), and

considered values equal or higher than .90 in case of incremental indexes and between ≤ .05 and ≤ .08 in absolute indexes, to avoid the rejection of good models.

The theory underlying the ML (maximum likelihood) estimation method assumes data have a normal multivariate distribution, which is necessary to analyse Mardia's coefficient (see Mardia, 1970). According to Byrne (2010), a normalized Mardia's coefficient higher than 5.0 indicates that the data does not have a normal multivariate distribution.

Regarding the differences in the study, initially, we made a univariate analysis of location measures and central tendency (mean) and dispersion measures (standard deviation). Secondly, we used parametric statistic techniques since the sample size allowed us to do so, and also because parametric tests confer a greater power when compared to non-parametric tests (Ho, 2014) in order to study the differences in terms of subjective happiness and subjective vitality between the different physical activity levels, because we used an ANOVA One Way test (means comparison in more than two groups), complemented with a Post-hoc Tukey HSD. The significance level adopted to reject null hypotheses was p ≤ .05. Effect sizes are reported as partial eta-squared (η_P^2), with cut-off values of: trivial (0 –.19); small (.20 – .49); medium (.50 – .79) and large (0.80 and greater) (Cohen, 1992).

RESULTS

Regarding data adjustment to the measurement models, as seen in Table 1, all measurement models adjusted themselves to the data in a satisfactory way, even though not all cut-off values adopted in the methodology were reached in every model (Hu & Bentler, 1999). However, as it was mentioned in the methodology, some authors equally advise to consider values that are equal to or above .90 in incremental indexes and between ≤ .05 and ≤ .08 in absolute indexes (Byrne, 2010; Hair et al., 2014; Marsh et al., 2004) thus avoiding the rejection of good models.

In relation to the data's adjustment to the measurement models (Table 2), all presented a good adjustment, being in agreement with the

cut-off values adopted in the methodology (Byrne, 2010; Hair et al., 2014; Marsh et al., 2004).

In table 2 are presented the data concerning to the convergent and discriminant validity, as well, composite reliability for all measurement model's used.

Table 1

Adjustment indexes of the SVS, BNSG-S, SHS

Models	χ^2	df	SRMR	TLI	CFI	RMSEA	90% CI
SVS	28,95	9	.04	.93	.96	.08	.05-.02
BNSG-S*	59.09	41	.033	.96	.97	.04	.011-.058
BNSG-S**	46.63	41	.043	.97	.98	.03	.000-.052
SHS	.00	0	.000	1	1	.00	.00 - .05

Note. *first order model (three factors) Satorra-Bentler performance; **second order model (one second order factor, three first order factors) Satorra-Bentler performance.

Table 2

Realibility Composite, Convergente and Discriminant Validity of measurement model's

Models	CR	AVE	Autonomy	Competence	Relatedness
Autonomy	.71	.45	1	.46*	.37*
Competence	.50	.25	-	1	.92*
Relatedness	.76	.39	-	-	1
2ª Order Factor BPN	.94	.77	-	-	-
SVS	.80	.42	-	-	-
SHS	.74	.46	-	-	-

Note. CR: Composite Reliability; AVE: Average Variance Extracted; BPN: Basic Psychological Needs; SVS: Subjective Vitality Scale; SHS: Subjective Happiness Scale.

Through Mardia's coefficient, we verified the presence of the non-normal multivariate, once the obtained value of 32.50 exceeded the adopted cut-off value of 5.0 (Byrne, 2010). Therefore, Bollen-Stine bootstrap on 2,000 samples was used (Nevitt & Hancock, 2001). No missing values, univariate outliers (z<3) and multivariate outliers (D^2= p1>.001; p2>.001) were detected (Byrne, 2010).

Through structural equations analysis, we observed that the initially hypothesized model (model 1) adjusted itself to the data χ^2 = 156.016; df = 63; B-S = p < .000; SRMR = .070; TLI = .90; CFI = .919; RMSEA = .070 90% IC .057—.084, although we did not reach the cut-off values

from Hu and Bentler (1999) that we had adopted in the methodology.

As Model 1 addresses BPN in a total satisfaction manner, not discriminating the three BPN categories (i.e., autonomy, competence and relatedness), we also studied the way each BPN independently influences the studied variables (i.e., subjective happiness, subjective vitality, physical activity category). Thus, we analyzed three other models, one for each BPN, to verify the adjustment of the models to the data for all the BPN, as Table 3 shows, even though we did not reach every cut-off value from Hu and Bentler (1999).

Table 3

Adjustment indexes of the tested models

Models	χ^2	df	B-S	CFI	TLI	SRMR	RMSEA	90% CI
Model 1	156,016	63	.000	.919	.900	.070	.070	.057 - .084
Autonomy	172.233	63	.000	.922	.901	.067	.068	.054 - .082
Competence	155.820	63	.000	.919	.898	.054	.066	.052 - .080
Relatedness	232.474	88	.000	.919	.900	.066	.063	.051 - .075

Note. χ^2 = chi-square; df = degrees of freedom; B-S= Bollen-Stine bootstrap; 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 from RMSEA.

By the analysis of the effect of BPN total satisfaction in the life of Portuguese elderly individuals on the studied well-being variables and physical activity, we verified, as shown in Figure 2, that positive and significant effects exist between BPN satisfaction, subjective happiness (ß = .29) and subjective vitality (ß = .48). Regarding physical activity, the positive effect between BPN and physical activity (ß = .13) was not significant.

We also analyzed models that reflect the relation of each BPN individually, namely on well-being and physical activity. In this way, for the BPN of autonomy, we confirmed a positive and significant effect on happiness (β = .40) and vitality (β = .59), and a not significant positive effect on physical activity (β = .06); on the other hand, the BPN of competence obtained a direct and significant effect on subjective happiness (B = .50) subjective vitality (β = .73) and physical activity (β = .33). At last, relatively to the BPN of relatedness, we also verified a direct and positive effect with subjective happiness (β = .17) and subjective vitality (β = .35), and a not significant positive effect was obtained for physical activity.
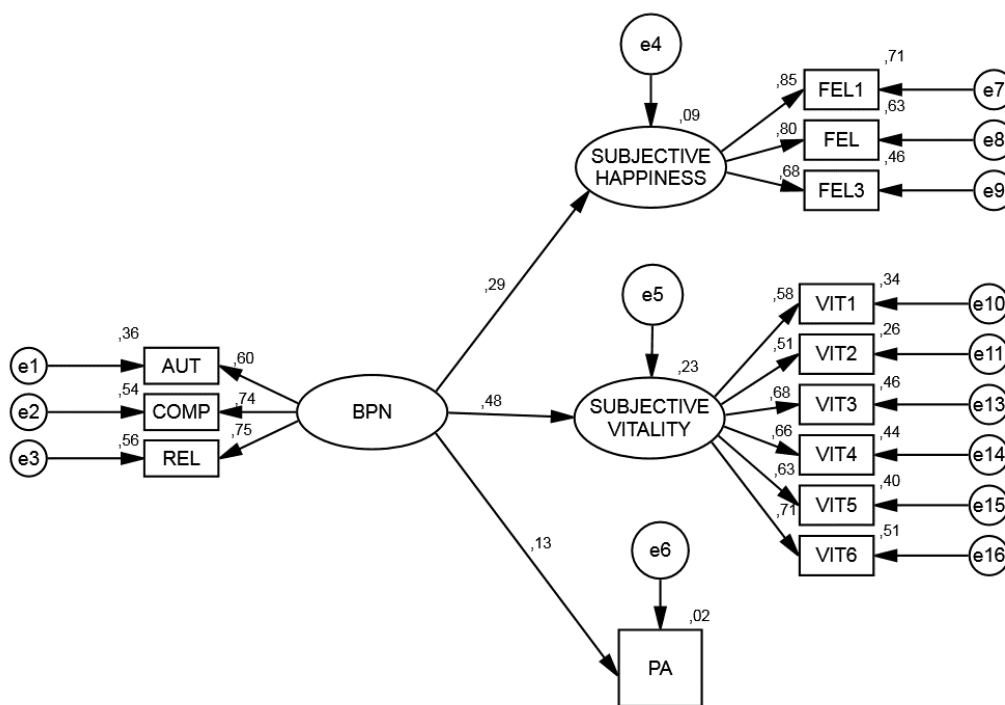

Figure2. Individual parameters standardized from the model

Regarding the differences in the study, we found it possible to verify, as shown in Table 4, that in a general way, individuals included in Category 3 of physical activity had a higher valorization of the studied variables. On the other hand, individuals in Category 1 of physical activity presented the lowest average levels of subjective happiness and subjective vitality.

In the means comparison between physical activity categories, we found it possible to verify by One Way ANOVA analysis, after confirming the normality through p non-signification (p ≥ .05) in the Kolmogorov-Smirnov test, that statistically significant differences exist between physical activity categories regarding the analyzed well-being dimensions ($F_{Subjective\ happiness}$ = 8.50, p < .01; $F_{Subjective\ Vitality}$ = 7.29, p < .01).

Afterwards, we conducted the multiple comparisons of means through the analysis of a Post-hoc Tukey test, because the variances are homogeneous (Levene´s test ≥ .05). Regarding subjective happiness, we found a significant

statistical difference (p = .001) between Category 1 (M = 4.41; SD = .16) and Category 3 (M = 5.12; SD = .08) for physical activity and significant differences (p = .034) between Category 2 (M = 4.80; SD = .09) and 3 (M = 5.12; SD = .08) for physical activity, yet, we found no differences between Category 1 (M = 4.41; SD = .16) and 2 (M = 4.80; SD = .09) for physical activity. Regarding subjective vitality, the results from the Post-hoc Tukey test, like those about subjective happiness, showed a

significant statistical differences (p = .002) between Category 1 (M 4.49; SD = .17) and 3 (M = 4.99; SD = .56) for physical activity and significant differences (p= .039) between Category 2 (M = 4.75; SD = .08) and 3 (M = 4.99; SD = .56) for physical activity, showing no significant differences between Category 1 (M 4.49; SD = .17) and 2 (M = 4.75; SD = .08) for physical activity. We can also verify an existence of a trivial effect size in both variables.

Table 4

Mean and Standard Deviation of Subjective Happiness and Subjective Vitality between physical activity groups

	Category 1 (n=37) M±SD	Category 2 (n=100) M±SD	Category 3 (n=172) M±SD	F	p	η_p^2
Subjective Happiness	4.41 ± 1.61[a]	4.80 ± .09[b]	5.12 ± .08	8.51	.001	.053
Subjective Vitality	4.49 ± .17[a]	4.75 ± .09[b]	4.99 ± .56	7.30	.001	.046

Designations: M= Mean; SD= Standard Deviation; F = Statistic F; *p*= p-value; η^2EtaSquare; Post-hoc comparisons (Tukey HSD): [a] significant at *p*<.01 (between category 1-3); [b] significant at *p*<.05 (between category 2-3); η_p^2 Partial eta-squared.

DISCUSSION

Successfully aging assumes the following: avoiding diseases and/or incapacities; maintaining a high physical and cognitive function; and engaging in productive social activities in a sustained manner (Rowe, 1997). Therefore, physical activity is essential in this process, whether to the capacity to keep individual's functionality overtime, or to the capacity to recover from limitations linked to the course of time (NIA, 2010). Taking this into account regarding the main goal of this study, we conducted an analysis of hypothetical causal relationships between BPN in elderly Portuguese individuals' overall lives, including their subjective happiness, subjective vitality and the practice of physical activity.

Therefore, the initially hypothesized model (Model 1) was satisfactorily adjusted to the data, even though some of the cut-off values adopted in the methodology were not reached. As was already demonstrated, we also tried to understand how each isolated BPN relates with the studied well-being dimensions and physical activity, and established a single model for each BPN.

Similar to Model 1, all other models were adjusted to data, yet they did not comply with the cut-off values from Hu and Bentler (1999) to the

incremental indexes CFI and TLI and to the absolute index RMSEA. However, as was previously mentioned, some authors (e.g., Byrne, 2010; Hair et al., 2014; Marsh et al., 2004) equally advised researchers to consider values equal or higher than .90 in incremental indexes and values between .05 and .08 in absolute indexes in order to avoid the rejection of good models.

Thus, as is visible in Figure 2, the results from Model 1 indicate that the BPN satisfaction in the overall life of the Portuguese elderly population significantly predicts subjective happiness and subjective vitality. The same, however, did not happen with the practice of physical activity, since besides the positive direct effect of BPN on physical activity not significant (p ≥ .05). Therefore, it is possible to affirm that as elderly individuals globally perceive a greater BPN satisfaction in their lives, they likewise perceive higher levels of subjective happiness and subjective vitality, consequently, determining a positive effect on the studied well-being variables.

In a study containing a sample that included elderly individuals, Reis, Sheldon, Gable, Roscoe, & Ryan (2000) also verified that a bigger perception of BPN satisfaction also determines a positive variance of positive affections, happiness

and subjective vitality. Sheldon and Niemiec (2006) also ascertained that each BPN, in an individual manner, significantly predicts happiness. More recently, Molix and Nichols (2013) confirmed, among other results, a positive connection between BPN satisfaction and a eudemonic and hedonic perspective of well-being, data that corroborates the positive influence of BPN on well-being in both perspectives.

To the individual analysis of each BPN (i.e., autonomy, competence, relatedness), we developed three independent models, and, as indicated earlier, they adjusted themselves to the data. All separate BPNs are predictors of subjective happiness and subjective vitality. Regarding subjective happiness, the BPN of competence presented the biggest direct effect and the BPN of relatedness presented the lowest, though all were significant (p ≤ .05). Data that was also corroborated by the work done from Sapmaz, Doğan, Sapmaz, Temizel, & Dilek Tel (2012) where, through a sample of Turkish adults, they verified a positive contribute of BPN on happiness, as well as they verified that the BPN of competence has the biggest influence on subjective happiness, followed by autonomy and relatedness, respectively.

Regarding subjective vitality, all BPNs also presented a positive and significant direct effect (p ≤ .05), meeting Ryan and Deci's (2008) expectations in that they confirmed that the behaviours that predict BPN satisfaction are essential to subjective vitality maintenance. Just as the case with subjective happiness, the BPN of competence also presented the highest direct effect and the relatedness need presented the lowest direct effect. Sheldon, Ryan, and Reis (1996) studied BPN's fluctuation over a period of two weeks and also verified that the BPN of competence has the biggest influence on subjective vitality.

Regarding physical activity, BPN satisfaction in elderly Portuguese people's overall life did not significantly predict the practice of physical activity, since, even though there is a positive direct effect, it is not significant (p ≥ .05). In other words, it is not the fact that the elderly perceives a bigger satisfaction of all BPN in their lives that makes them practice more physical activity. Nevertheless, by individual analysis of BPN, the results verified that there is a significant (p ≤ .05) and a positive direct effect between the competence need and the practice of physical activity, indicating that the elderly who perceive a bigger satisfaction of competence need in their daily lives practice more physical activity.

The competence need refers to the efficacy of an individual's interactions in a certain context, resulting in more opportunities to manifest his or her capacities (Ryan & Deci, 2002). In other words, the success of these interactions has as an outcome an increase in competence that automatically happens, providing new learning intentions (Krapp, 2005), and this is an important issue because elderly people's daily competence also refers to the individual's personal capacity to participate in several activities that are considered essential to their independence (Diehl, 1998). To sum up, if changes linked to aging involve a perception of incompetence or feelings that reduce a person's self-determination to continue a behaviour (Vallerand, O'Connor, & Hamel, 1995), then, it seems the promotion of competence's BPN plays an essential role in the lives of the elderly Portuguese population.

Results from the current study also evidenced that there are significant differences in well-being variables underlying the practice levels of physical activity, as was shown likewise in the work of Neto et al. (2012) and of Withall et al. (2014). This means that those who have higher levels of physical activity have a bigger perception of subjective happiness and subjective vitality compared to the individuals who have lower levels of physical activity. This data confirms the importance of physical activity to promote well-being in this population.

Additionally, the results verified that differences of well-being exist between Categories 1 (low) and 3 (vigorous) of physical activity and between 2 (moderate) and 3, both with trivial effect-size. Yet, we found no differences about well-being between Categories 1 and 2. The non-existence of differences between these two categories may be explained by the small difference of weekly minutes of moderate

physical activity between the two categories. In order to be in Category 2 of physical activity, individuals needed at least 150 min./week of moderate physical activity or walking; however, the individuals in Category 1 did practice physical activity, although not enough to be in Category 2, which fact might explain the existing difference between Categories 1 and 3, since the amount of physical activity differs much more significantly. Nonetheless, the difference of METs/week between Categories 2 and 3 is higher than comparing Categories 1 and 2, which justifies the existence of differences in the studied well-being variables between Categories 2 and 3 from IPAQ as well.

CONCLUSION

With this work, the results demonstrate to the elderly population that physical activity influences the studied well-being dimensions, since those who have more practice of physical activity had higher levels of subjective happiness and subjective vitality. The results also verified that BPN in elderly people's overall life predicts subjective happiness and subjective vitality, since the elderly who perceive higher BPN satisfaction in their overall life perceive more subjective happiness and subjective vitality, too. The results also verified that the BPN of competence has a greater influence on subjective happiness and subjective vitality more than being a positive direct predictor of a bigger practice of physical activity in this population, which leads to indicate that it is vital in elderly Portuguese people's lives.

Therefore, it seems crucial to promote BPN satisfaction, especially in the area of competence, in the several life domains of Portuguese elderly individuals, in all the domains that are part of their daily lives, whether to the potentiation of well-being that they promote, or to the positive influence on the practice of physical activity. In this way, it is fundamental for all those who are part of the elderly's daily lives, to be aware of the BPN importance in their lives, and they should be fundamental elements in the promotion of their well-being, through the establishment of the conditions capable of promoting satisfaction of all BPN in this population. It also seems to us fundamental for this population, to promote efficient strategies that determine a greater amount of physical activity practice in elderly people, in order to promote a greater perception of well-being.

The necessity to continue the study of these variables also seems evident. In the first place, we believe that is important to analyze the invariance of the model according to gender, using for that a more balanced sample between men and women, which is not verified in the present study, that allows verifying the influence of this variable in relation between the BPN, the well-being and the physical activity. In the second place, with a physical activity assessment that enables a more effective quantification (e.g., pedometers) that would contribute to the clarification of the determinants and consequences of physical activity practices in this population, even though, unfortunately, we continue to see a tiny amount of physical activity practiced and all the harmful consequences to the life quality of the elderly.

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