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Adaptation of a 3-factor model for the Pittsburgh Sleep Quality Index in Portuguese older adults

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ABSTRACT

The present study examined the factor structure of the Pittsburgh Sleep Quality Index (PSQI) in a sample of older Portuguese adults using a cross-validation approach. Design is a cross-sectional. A convenience sample of 204 community-dwelling older adults (M=70.05, SD=7.15) were included. The global sleep quality (GSQ) score ranged from 0 to 18 with a mean of 5.98 (SD ± 3.45). The distribution showed that gender and perception of oneself as healthy influences GSQ in this sample. Cronbach's α was 0.69, but increased to 0.70 if the “use of sleep medication” component was deleted. Exploratory factor analysis (EFA) demonstrated two factor model is better than one factor, and a model fit with good indices (chi-square=8.649, df=8, p=0.373). Confirmatory factor analysis (CFA) was performed on the single factor, two factor, and three factor models, with and without the “use of sleep medications” component. The best model was the 3-factor model without the “use of sleep medications” component (chi-square=1.214, df=6, GFI=0.997, AGFI=0.918, CFI=0.986, RMSEA=0.046). The adaptation of the model is similar to the original model, with the only change being the exclusion of the "use of medications to sleep" component. We suggest using that component as a complementary qualitative assessment of health.

1. Introduction

Currently, sleep problems constitute a global epidemic that threatens the health and quality of life of approximately 45% of the world's population (Wade et al., 2008; WASM, 2016). Sleep deprivation and poor sleep quality have a high negative impact on health in the short and long term. Poor sleep quality has a negative impact on attention, memory and learning (WASM, 2016). It has also been associated with several serious health problems such as obesity, diabetes, and some cancers (Gottlieb et al., 2005; Gümüştekín et al., 2004; Taheri et al., 2004; WASM, 2016). In addition, many psychological disorders such as depression, anxiety and psychosis are also associated with sleep difficulties (Beusterien et al., 1999; WASM, 2016; Zammit et al., 1999).

Although the majority of sleep disorders are easily prevented or treated, fewer than one-third of those affected seeks professional assistance (WASM, 2016). However, sleep is a basic need of all people, just like eating and drinking, being crucial to ensure good health and quality of life (WASM, 2016). In a comprehensive epidemiological studies, it was found that more than 50% of older adults have insomnia complaints (Foley et al., 1995; Neikrug and Ancoli-Israel, 2010), and sleep improvement was associated with health improvement (Foley et al., 1999; Neikrug and Ancoli-Israel, 2010). However, other studies have also shown that the rates of sleep disorders are lower in healthy older adults (Neikrug and Ancoli-Israel, 2010; Vitiello et al., 2002). So, what changes over the lifespan is not an intrinsic ability to sleep well, but comorbidities related to aging, and not necessarily caused by aging itself (Neikrug and Ancoli-Israel, 2010).

Thus, the ability to identify any difficulties in sleep as soon as possible is essential for the screening of other important comorbidities to act in maintaining good quality of life and well-being of older people. The sleep assessment instrument most commonly used in clinical and research environments is the Pittsburg Sleep Quality Index - PSQI (Mollayeva et al., 2016). It is a self-assessment questionnaire with 19 items that measures sleep disorders through seven components that together make up a Sleep Quality score (Buysse et al., 1989). Several studies have examined the one-dimensionality of the PSQI and raised concerns about the factorial structure of the instrument (Mollayeva et al., 2016). Through a systematic review and meta-analysis it was found that eight out of eleven studies that factor analyzed the PSQI reported that a single factor model poorly fit the resulting data, and the

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PSQI is best represented by a model with two or three factors (Mollayeva et al., 2016).

Relatedly, analysis of the instrument using a Portuguese sample (João et al., 2017) found poor reliability (Cronbach's alpha). As demonstrated by Mollayeva et al. (2016), most studies using factor analysis achieved better results with a model with two or three factors. We understand that it is necessary to adapt a three factor model for the PSQI as, previously, reported by Cole et al. (2006), which will give an upgrade in our sample.

2. Methods

2.1. Research tools

2.1.1. Pittsburgh Sleep Quality Index

The PSQI assesses sleep quality over a one-month period. The questionnaire consists of 19 self-rated questions and five (5) questions that are to be answered by bedmates or roommates. These last five questions are used only for clinical information and, therefore, they are not tabulated in the scoring or reported in this article. The 19 self-rated questions are grouped into seven (7) components, with each one scored on a scale that ranges from 0 to 3 (see more detail in the original study, Buysse et al., 1989). The PSQI components are the following: 1) subjective sleep quality, 2) sleep latency, 3) sleep duration, 4) habitual sleep efficiency, 5) sleep disturbances, 6) use of sleeping medication, and 7) daytime dysfunction. The sum of these components yields one global score, which ranges from 0 to 21, where the highest score indicates the worst sleep quality. A global PSQI score greater than 5 indicates major difficulties in at least two (2) components or moderate difficulties in more than three (3) components (Buysse et al., 1989). The Portuguese version of the PSQI (João et al., 2017) was used in this study to evaluate its psychometric properties and the degree of fit of the three factor model in Portuguese older adults.

2.2. Sample

This study used a cross-sectional design. A convenience sample of 204 community-dwelling (152 females and 52 males) older adults (aged M=70.05, SD=7.15) were included. They were recruited in senior universities in Portugal. The inclusion criteria were: (a) more than 60 years old; (b) ability to understand, read and write in Portuguese; (c) does not live in nursing home; and, (d) does not require permanent medical care in a specific location. Those who lacked mental clarity about the scales or could not read the questions were excluded. All people who participated in this research gave their informed consent to answer the questionnaire.

2.3. Statistical analysis

A total of 204 questionnaires were completed and checked for data entry errors, missing data, or the presence of major outliers. Data analyses were performed with SPSS software version 21 and AMOS version-29. Given the nature of the variant and nonlinear transformations from item responses into component scores, statistical analysis was conducted on the component scores. The PSQI item responses were combined into seven different components (Buysse et al., 1989), which had small amounts of missing data, with no more than 5% missing data for any composite. A single-point multiple imputation procedure for missing data replacement (Schafer and Graham, 2002) was conducted for the missing points.

Descriptive statistics were computed for each sociodemographic and PSQI (global and components scores) variable, and their psychometric proprieties were examined (i.e., Cronbach's Alpha [α] was computed). Descriptive statistics were calculated as frequencies (%) for categorical variables, whereas means and standard deviations were computed for continuous variables. KMO and Bartlett tests were performed to determine the suitability of this sample for factor analysis. Subsequently, the sample was split randomly into two independent groups to perform EFA (exploratory factor analysis) and CFA (confirmatory factor analysis) through software command (SPSS 21).

EFA was performed on the first random sample (n=102) using maximum likelihood estimate extraction and direct oblimin rotation to examine the factor structure of the PSQI-PT in older adults. CFA was conducted using the AMOS-21 (AMOS development Corporation, Spring House, PA, USA) in the second random sample (n=102). In this analysis we tested the model identified through the EFA, the single factor structure of the PSQI, and the three factor model suggested by Cole et al. (2006). The adjustment of the model was assessed using several statistical indices including a chi-square test (non-significant values indicate good model fit), the root mean square error of approximation (RMSEA; values ≤0.08 indicate close approximate fit), and the comparative fit (CFI), goodness of fit (GFI), and adjusted goodness of fit (AGFI) indices (values > 0.97 indicate good model of fit) (Hair et al., 2010).

2.4. Ethical aspects

This research was performed in accordance with European research guidelines. All participants in this research freely consented to answer the questionnaire and signed an informed consent form before inclusion in the study.

3. Results

The PSQI-PT global score ranged from 0 to 18 with a mean of 5.98 (SD ± 3.45). The sociodemographic characteristics are in Table 1. The distribution of the global sleep quality (GSQ) scores is the same for the categories of sociodemographic variables (Table 1), except for gender and self-assessed healthiness ("Do you consider yourself a healthy person?"). The regression analysis showed that gender (β=0.195, t=2.72, p=0.004) and self-assessed healthiness (β=0.257, t=3.85, $p < 0.001$) significantly predict together a GSQ (r^2 =0.108, F =12.07, $p < 0.001$). Specifically, males (M =4.76) had significantly better average sleep quality than females (M =6.39), and individuals who said they considered themselves healthy had significantly better sleep quality than those who did not.

The PSQI-PT component descriptive statistics and the correlations between components are shown in Table 2. Each of the scores ranged from 0 to 3. The lowest inter-component correlation was between "use of sleep medications" and "habitual sleep efficiency" (r =0.12) and the highest correlation was between "habitual sleep efficiency" and "sleep duration" (r =0.52).

Using a recommended cut-off score of 5 (Buysse et al., 1989), 48.5% of participants were categorized as having a good sleep quality. Component-total correlations for all components ranged from 0.32 to 0.55, except for "use of sleeping medication," which was 0.24. The Cronbach's α for global sleep quality was 0.69, but increased to 0.70 if the "use of sleep medication" component was deleted from the reliability analysis; this indicates an adequate level of internal consistency (Schmitt, 1996).

KMO (0.731) and Bartlett (chi-square=142.922; df=21; $p < 0.001$) tests were performed and the results verified that factor analysis is suitable (Maroco, 2003) for this sample. Exploratory factor analysis (EFA) revealed (see Table 3) two components that loaded highly on factor 2 (but not on factor 1, i.e. "sleep disturbances" and "daytime dysfunction"), a result that was not consistent with Cole et al. (2006). The model properties verified good indices (chi-square=8.649; df=8; p=0.373), and there was a medium-sized effect (Cohen, 1988) for the correlation between the two factors (r=0.36). The use of sleep medication component did not load highly on either factor (0.302).

Confirmatory factor analysis (CFA) was performed on the single