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Sleep Science

Validation of a three-dimensional model about sleep: Habits, personal factors and environmental factors

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ABSTRACT

Objectives: The present study aims to test the factor structure of two sleep questionnaires and their internal consistency in a sample of adolescents and their respective parents and to evaluate the validity and robustness of a three-dimensional model about sleep, addressing nine subcategories related to sleep habits, personal and environmental factors.

Methods: Participants were 654 adolescents from Portuguese schools, who completed "My Sleep and I" questionnaire, and 664 parents who completed "My child's sleep" questionnaire; to them confirmatory factor analysis was applied.

Results: Confirmatory factor analysis indicate that a nine-factor model has better fit indices compared with the others tested models for both samples (adolescents: χ^2/df (Chi-square/degrees of freedom)=2.59, Comparative Fit Index (CFI)=.82, Goodness-of-Fit Index (GFI)=.92, Root Mean Square Error of Approximation (RMSEA)=.049, Expected Cross-Validation Index (ECVI)=1.416; Parents: χ^2/df=2.89, CFI=.85, GFI=.91, RMSEA=.053, ECVI=1.528). Moreover, the comparison of the models through $\Delta\chi^2$ index (chi-square difference between rival models) indicates a better fit for this model, $\Delta\chi^2$ (24)=186.5, $p<.001$ for adolescents and $\Delta\chi^2$ (24)=209, $p<.001$ for parents. Also, the three second-order factors have good internal consistency, convergent and discriminant validity for all factors in both samples.

Conclusions: Results postulate that the three factors and their nine subcategories account for correlations between sleep habits, self-perceptions and knowledge about sleep.

1. Introduction

Sleep constitutes a homeostatic mechanism and many of our survival functions depend on sleep and on sleep quality [11]. Although sleep is critical for our general development [4], it is also a social subject, which means that our culture and lifestyles have an important role in sleep quality and duration [10]. It is accepted that social and familiar environments have great impact on sleep, especially regarding daily routines [18]. On the other hand, sleep is constantly neglected in modern societies, particularly between young people who are challenged by social and interactive activities that are called "sleep stealers" [23].

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Sleep is regulated by a complex set of genetic, biological, psychological, cultural and environmental factors [17], but it is also strongly affected by cultural values, habits and beliefs, such as bedtime routines or sleep schedules, sleep environment, sleep literacy and autonomy around sleep [19].

Sleep development across the first years of age is very significant; there are a number of modifications on its macro and microstructure, on its circadian regulation and duration [15,30]. During development, the family context also represents an important issue for children and adolescents' sleep and daytime functioning [22]. Across adolescence, the use of technologies, social and academic compromises can frequently disturb sleep habits and quality. Despite there are different mechanisms that regulate sleep across growth and also distinct sleep problems, it is important to describe a valid model that can be easily adjusted to different persons and age groups [3].

Sleep deprivation is considered a relevant risk factor for health and security [7,8], since it increases the chance of getting cardiovascular diseases, hypertension, obesity, diabetes, depression, mood disturbances, etc. (Landhuis et al. [20], Orzeł-Gryglewska [26], Padez et al. [27,28], Paiva et al. [29]), increases health complaints while having a negative impact upon quality of life [31]. Bad sleep has been related to aggressive behaviors, anxiety, accidents, substance abuse [9,6,30] and academic failure [1,2].

Regarding all these risks it is important to prevent sleep problems and to promote good sleep habits since childhood [24]. The importance of sleep education programs has been well established [3]. According to Noland et al. [25], the central issue of adolescents' sleep relies on their behaviors and attitudes towards sleep, so we should address these issues in sleep prevention and education, more than just spread the basic sleep hygiene rules as most of sleep programs do [16,33], and integrate sleep interventions in a familiar process [22].

Models that can both explain and evaluate sleep, while being usable in sleep education strategies are lacking [34]. These models are often based on sleep questionnaires. In the evaluation of sleep, questionnaires are a valid method to track sleep disturbances and can be used as reliable tools in daily clinical practice, if properly validated for the target population [32]. The existence of questionnaires for parents and children is an approach in the family context, providing important and innovative contributions towards an improved characterization of the children's sleep, while raising parents' awareness.

This work aims to fill these gaps; it proposes a model of sleep education to be used in primary prevention by different professionals, and an assessment tool to be used clinically in medical/sleep consultations.

1.1.   Overview of the study

The present study aims to test the factor structure of two questionnaires "My sleep and I" for adolescents and "My children's sleep" for parents, and their internal consistency. We propose a three-dimensional model about sleep that addresses sleep habits, personal factors and environmental factors. We postulate that those three factors and their subcategories will account for correlations between sleep habits, self-perceptions and knowledge about sleep. Our hypothesis is that a model with three second-order factors and nine first-order factors will fit in the context of sleep in adolescents as assessed by themselves and their respective parents. Additionally, we tested convergent and discriminant validity for those three factors.

2.   Materials and methods

2.1.   Participants

Participated in this study a total of 654 adolescents (321, 49,1% girls and 333, 59,9% boys) with an average age of 11.9 years (SD=1.34, min=10, max=15), who attended the basic education level (219, 33.5% in 5th grade; 19, 2.9% in 6th grade, 164 25.1% in 7th grade, 77, 11.8% in 8th grade, and 175, 26.8% in 9th grade), at schools in the north, center and south of Portugal. Also participated a total of 612 parents (78, 12.8% fathers and 534, 87.3% mothers), with an average age of 38.9 (SD=6.21, min=21, max=68) years.

2.2.   Instruments

The self-report questionnaire "My Sleep and I" and the hetero-report questionnaire "My children's sleep" were used to assess adolescents' and parents' perceptions about the adolescents' sleep, respectively. Both instruments consist of 27 Likert items, on a five-point scale, organized in 3 dimensions and 9 sub-dimensions. The first dimension, named *sleep habits*, refers to what adolescents usually do in terms of duration, schedules and sleep regulation. This factor has three sub-dimensions: *length* (total sleep time), *regularity* (timings sleep pattern), and *autonomy* (ability to regulate the sleep itself). The second dimension, called *environmental factors*, comprises lifestyle impact on sleep and includes three subcategories: the *room* (characteristics and location of sleep features), *activities* (distribution of different tasks throughout the day) and *feeding* (time, quantity and quality of meals and consumption of substances). The latter dimension, called *personal factors*, refers to feelings, knowledge and adolescent problems related to sleep and comprises three subcategories: *knowledge* (relates to adolescent's knowledge about sleep), *feelings* (encompass emotions about sleep) and *problems* (difficulties or distress experienced in relation to sleep). Both questionnaires are adequately adapted and validated to be used in Portuguese population [21].

2.3.   Procedure

This study is part of a broader project "*Sleep More to Read Better*", integrating the Portuguese National Reading Plan. Thus, for the data collection, we requested permission from the school' boards participating in the project, and obtained the informed consent from parents and students for their participation in this research.

Some criteria were considered for inclusion in the sample, such as Portuguese as native language, to be a student of 2nd or 3rd academic cycles (5th and 6th grades or 7th, 8th and 9th