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Subjective and objective sleep quality in elderly individuals: The role of psychogeriatric evaluation

Vanessa Ibáñez-del Valle[a], Josep Silva[b], Ana-Belén Castelló-Domenech[c], Mary Martinez-Martinez[d], Yolanda Verdejo[d], Laura Sanantonio-Camps[d], Omar Cauli[c,*]

[a] Department of Clinical Nursing, Universidad Católica de Valencia, Spain
[b] Computer Science Department, Universitat Politècnica de València, Spain
[c] Department of Nursing, University of Valencia, Spain
[d] La Saleta Residencias, Spain

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ABSTRACT

Aging affects sleep and sleep problems are common in older individuals. However, the relationship between objective and subjective tools for analysing sleep and psycho-geriatric variables have not been tested in institutionalised older individuals. This work analyses sleep quality by using actigraphy as an objective tool and validates the Athens and Oviedo sleep questionnaires in octogenarian elderly individuals as subjective scales of sleep perception. All patients wore an actigraph device for one week and then completed the Athens and Oviedo clinical sleep-evaluation questionnaires. Morning cortisol levels in blood plasma and saliva samples were also measured to assess the association between objective and reported sleep patterns. Age, gender, and psychogeriatric evaluations, including Barthel, Tinetti, and Mini-Mental scale measurements were analysed as variables with the potential to confound the strength of any such associations. There was a significant inverse correlation between the number of awakenings and the time spent awake during night assessed by actigraphy and the total Oviedo questionnaire score, but no significant associations for the other parameters. The blood cortisol concentration appears to be a marker of insomnia related to sleep times of less than four hours and diagnosis of insomnia based on Athens scale and thus, represents a potential marker for sleep interventions.

1. Introduction

Sleep disorders are common in elderly populations (Rodriguez, Dzierzewski, & Alessi, 2015) and aging can influence sleep patterns (Foley et al., 1995; Mellinger, Balter, & Uhlenhuth, 1985). When sleep alterations appear, they can significantly reduce quality of life and promote adverse outcomes in other pathologies (Sariarslan, Gulhan, Unalan, Basturk, & Delibas, 2015). Although some older adults complain of poor night-time sleep and subsequent impairments in daytime functioning, others assume that their difficulties are part of the normal aging process and so do not complain about their sleep problems, even when the quality of their sleep is impaired. The mechanisms behind sleep misperception are still poorly understood and thus, the comparison of objective and subjective sleep quality has more recently become a research target in relation to different diseases, e.g. (Chen, McHugh, Campbell, & Luker, 2015; Hasselberg, Porsteinsson, Boyle, & Parker, 2013; Klumpp et al., 2017), such as depression or diseases characterised by cognitive impairment, where both sleep quality and the perception of sleep are of paramount importance.

Because questionnaires are the most commonly used instruments for detecting sleep problems, it is crucial that subjective descriptions of sleep quality be correlated with objective measurements made with tools such as actigraph devices so that any interventions to improve sleep duration, maintenance, or sleep onset latency can be adequately implemented. Recent studies (Chen et al., 2015; Klumpp et al., 2017; Landry, Best, & Liu-Ambrose, 2015) have used actigraphy as an objective measurement of sleep quality because technological advances in actigraph instruments have improved their precision in measuring sleep in patients' normal environments (e.g., at home) for long periods of time. In contrast, polysomnography can only be administered for very short periods and the sleep is assessed outside patients' normal contexts (e.g., in a hospital environment). In this latter technique, patients are hooked up to machines via up to 20 electrodes placed on their body and head and are required to sleep in a laboratory setting with cameras rather than in their own bed. Hence, it is understandable that subjects might not sleep normally in this context. Moreover, recent validation

* Corresponding author at: Department of Nursing, University of Valencia, Valencia, Spain.
E-mail address: Omar.Cauli@uv.es (O. Cauli).

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studies focusing on actigraphy have justified its use as an objective measurement of sleep, e.g. (Meadows et al., 2010; Meltzer et al., 2016).

Many sleep-related disorders are underdiagnosed in older individuals, and others respond poorly to pharmacological treatments. Moreover, psychotropic drugs can induce a wider variety of side effects in older individuals compared to younger populations and so it is important to specifically evaluate their utility in the management of sleep problems in older individuals. Therefore, the main aim of this present study was to perform a focused evaluation of sleep quality, correlating objective measurement (actigraphy) and results from corresponding subjective evaluation tools (Oviedo and Athens questionnaires), in relation to geriatric evaluation scales. Because changes in cortisol have been linked to sleep alterations in older individuals (Castello-Domenech, Ibáñez Del Valle, Fernandez-Garrido, Martinez-Martinez, & Cauli, 2016; Kushida, 2004; Leproult & Van Cauter, 2010; Vgontzas et al., 1999) we also evaluated the relationship between the morning concentration of cortisol in blood and saliva in these patients and their sleep quality. Thus, we investigated the following three objectives:

(1) Evaluate sleep quality in older institutionalised individuals by actigraphy and validated sleep-related questionnaires.
(2) Assess the relationship between sleep quality and psycho-geriatric evaluation.
(3) Analyse the association between morning cortisol concentrations and sleep quality and efficiency.

2. Methods

2.1. Study design and sample population

This research study had a cross-sectional design and was conducted between 2014 and 2016 with institutionalised elderly individuals living in different nursing homes located in Valencia and its province (GeroResidencias La Saleta, Valencia). The inclusion criteria were: institutionalisation for at least 6 months, ability to understand the sleep-quality questionnaire questions, and age of 60 years or older. The exclusion criteria were severe cognitive impairment or inability to speak, poorly-controlled psychiatric disease (e.g., schizophrenia or bipolar disorder), blindness, or the presence of acute infections, known cancer, or active corticoid treatment. The research complied with the requirements of the Declaration of Helsinki and the entire study protocol was approved by the local ethics committee at the University of Valencia (approval reference number: H1384175284261). All the participants signed a written informed consent form. A total of 62 patients (from 93 who met the inclusion criteria) from six different residences for the elderly signed their consent and participated in the study. Sociodemographic and pharmacotherapeutic treatment data were collected and the Charlson comorbidity index (Charlson, Pompei, & Ales, 1987) was calculated to quantify their pluripathological burden.

2.2. Evaluation of subjective quality of sleep

Sleep quality was measured using two validated tools: the Athens insomnia scale (Soldatos, Dikeos, & Paparrigopoulos, 2000) and the Oviedo questionnaire (Bobes et al., 1998), and data were collected by trained personnel via face-to-face evaluations. The Athens insomnia scale (AIS) is a self-administered psychometric instrument designed to measure sleep difficulty based on the diagnostic criteria of the 10th revision of the international statistical classification of diseases and related health problems (ICD-10) and has been validated in a Spanish population (Jiménez Genchi & Nenclares Portocarrero, 2005). It consists of eight items scored from 0 to 3: the higher the score, the greater the reported difficulty in sleeping. The first five factors are related to night-time sleep and the last three factors are related to daytime dysfunction. On the AIS, a cut-off score of 6 or more establishes the diagnosis of insomnia (Soldatos, Dikeos, & Paparrigopoulos, 2002).

The Oviedo sleep quality questionnaire (SQQ) helps to diagnose insomnia- and hypersomnia-type disorders according to the 4th edition of the diagnostic and statistical manual of mental disorders (DSM-IV) and ICD-10 criteria. The SQQ comprises 15 items; 13 are grouped into three subscales of: subjective sleep satisfaction (one item), insomnia (nine items), and hypersomnia (three items); the remaining two items give information about other organic alterations that can induce sleep disorders such as snoring with awakenings, nightmares or restless legs syndrome and the use of non-prescription drugs or herbal infusions to induce sleep. The insomnia subscale explores different dimensions such as sleep latency, duration, efficiency, and diurnal dysfunction due to altered sleep. All the items are answered using a Likert-type scale from 1 to 5, except the subjective sleep satisfaction item (measured on a scale of 1–7). The questionnaire also provides a score of the severity of the insomnia (score range: 9–45).

2.3. Actigraphy

Participants were recruited at their residences. A specialist nurse programmed the actigraph units, instructed the patients on how to wear them, and downloaded the collected data. The actigraph devices were configured with 1-min epochs (i.e., a sampling length of one minute) and the raw data collected from the actigraph was provided from its internal accelerometer. The accelerometer only provides proper acceleration data the XYZ dimensions and so software is required to transform and analyse these data: in our case we used ActiLife® software (http://actigraphcorp.com/products-showcase/software/actilife/). Sleep was detected using the Cole–Kripke algorithm (CKA) available from ActiGraph® (Cole, Kripke, Gruen, Mullaney, & Gillin, 1992) because it is the most appropriate algorithm for older individuals (Actigraphcorp.com, 2015). Thus, the filled areas representing sleep periods in the charts in Fig. 1 were determined with the CKA.

ActiLife® produces processed data that contains every single sleep period detected by the CKA for every patient, including where there are several sleep periods for one patient within the same day. From this information, ActiLife® can generate different reports but, unfortunately, it does not allow further transformation or manipulation of the displayed data. We wanted to produce more sophisticated reports and so we developed a complementary software system to extract additional derived and aggregated information from the raw ActiLife® data files. This analyser produces additional information including: average time spent asleep per day (including and excluding naps); average time spent in bed per day (including and excluding naps); and total time spent in bed in a wakeful state per day. The main information collected for each patient, including the actigraphy information, Oviedo and Athens questionnaire and blood and saliva test results, and the medical report

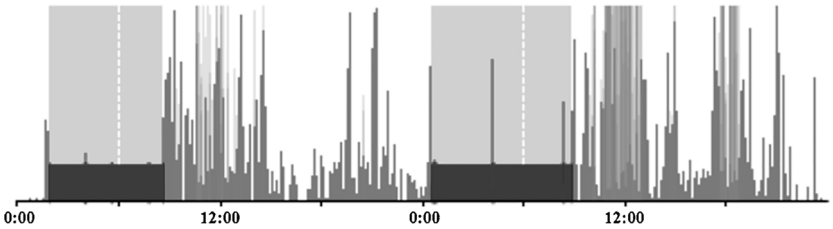

Fig. 1. Example of the activity recorded over one day with an wGT3X-BT® actigraph unit.