Depression and sleep quality in older adults: a meta-analysis

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Abstract

The literature emphasizes depression and poor sleep quality as problems that affect many elderly individuals. However, these problems have been related in few studies and there is no meta-analysis performed so far on this relationship. The present research reviewed the studies performed on the subjective sleep quality in order to understand how it relates to depression in older adults. The review was conducted in January 2016 and comprised publications between 2005-2015. Based on the electronic databases Web of Science and EBSCO, we used the keywords "sleep quality", "depression", and "older" to identify the empirical studies performed. After assessing the collected studies, we selected those that presented the elderly as participants, resulting in nine papers (N =3069). A random-effects method was used to evaluate the relationship between depression and sleep. We found that an older person's lack of good sleep quality is significantly related with depression. The main limitation of this study was the difficulty in collecting a greater number of studies. Future research should consider the importance of additional variables (e.g., moderators) in order to understand and investigate viable interventions for prevention and health promotion in the elderly.

Keywords: Ageing; Depression; Meta-analysis; Sleep quality

Introduction

Sleep difficulties comprise daytime impairments and nighttime sleep, according to the Diagnostic and Statistical Manual of Mental Disorders-V (DSM-V) (American Psychiatric Association, 2013). These include fatigue and daytime sleepiness, common aspects among older adults. Furthermore, DSM-V (2013) emphasizes that sleep disturbances cause clinical distress or behavior impairment in several important areas of functioning (e.g., social, occupational, and educational). The impact of sleep difficulties in one's life makes mental health evaluation an important strategy to assess sleep problems (Wu, Su, Fang, & Chang, 2012).

The Pittsburgh Sleep Quality Index (PSQI) is the most instrument to evaluate the sleep quality through seven dimensions (Buysse, Reynolds, Monk, Berman, & Kupf, 1989). The widespread use of this instrument has shown that subjective sleep disturbances increase the risk of depression both in younger and older individuals (Cho et al., 2009; Martin, Fiorentino, Jouldjian, Josephson, & Alessi, 2010; Park, Yoo, & Bae, 2013; Rashid & Tahir, 2015).

Given the importance of depression and subjective sleep quality for the health of elderly, it is relevant to conduct a synthesis on the empirical studies addressing this topic, particularly since there are no previous reviews or meta-analyses published on this relationship. Therefore, we assessed the studies that employed, in elderly' samples, the PSQI as an evaluation tool at the sleep quality and depression level.

Material and methods

This meta-analysis, which analyzed the period between 2005-2015, was conducted in January 2016 using the electronic databases Web of Science (WoS) and EBSCO. The search was conducted using the following terms: "sleep quality", "depression", and "older". The search was divided into five stages (Figure 1): (a) 359 references were found using the above-mentioned keywords; (b) the record's duplicates were removed; (c) the relevance of the studies was based on the following criteria: (c1) studies published in peer-reviewed journals; and (c2) empirical studies.

After this phase we registered a total of 97 studies; (d) considering the use of two sources, some studies did not contemplate the objective of this review and were excluded; and (e) in the last phase, we only considered studies that: (e1) have the presence of enough data to analyze "what has been studied" and "how it was studied"; (e2) were composed by samples of older adults; and in which (e3) depression and sleep quality were assessed with the Pearson correlation coefficient (*r*), resulting in nine articles. These studies were evaluated considering the source, setting, number of participants, average age, instruments used, and Pearson correlation coefficient (*r*). The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) was followed in the selection and classification of the studies (Liberati et al., 2009).

Only nine studies have been used in this meta-analytical procedure. Davey and colleagues (2011) consider the use of this procedure to be valid for the analysis of two or more studies. This assumption was corroborated by Botella and Gambara (2006). Past meta-analyses have used a minimum of two studies (e.g., Jesus & Rus, 2011, 2013). The assessment process was performed by two independent reviewers. In situations of incompatibility, a third reviewer served as a jury. For the quantitative synthesis we used the Pearson Correlation Coefficient (*r*) as a standardized effect size measure that allows comparisons between the results from different studies, following the formulas of Hunter and Schmidt (2004), and Morris and DeShon (2002). In the studies that did not present the value of magnitude effects we calculated it through the averages presented (using a weighted average).

(Figure 1)

Based on the random effects model, we assumed that the magnitude effects varied (Hunter & Schmidt, 2004; Kisamore & Brannick, 2007). The correlation (*r0*) of the weighted averages was calculated. The weighting criterion was the sample size (Brannick, Yang, & Cafri, 2011). This procedure places greater weight on correlations that are less susceptible to sampling error (Hunter &

Schmidt, 2004). Subsequently, the estimated confidence interval for each mean correlation was calculated. A 95% confidence interval was used to evaluate the accuracy of magnitude effect estimates. The variance values using this meta-analytic technique provide an indication of the degree to which the variability in all studies may be due to factors other than sampling errors. A value below 75% of the observed variation indicates the existence of moderation. The homogeneity of magnitude effects was assessed by the χ^2 test (Ellis, 2010), a significant probability indicates the presence of moderation.

Data were analyzed with the Comprehensive Meta-Analysis software version 2.2 (Villar, Mackey, Carroli, & Donner, 2001).

Results

The characteristics of the studies were discriminated (Figure 2) to establish a thorough summary of each research.

(Figure 2)

Figure 3 summarizes the results of the meta-analysis.

(Figure 3)

Our results indicated the existence of sample heterogeneity ($\chi^2 = 50.96$, $df = 10$, $p < 0.001$, $I^2 = 80.38\%$) and showed that moderators influence the relationship between sleep quality and depression. As shown in Figure 3, the percentage of explained variance (I^2) is more than 75% and the probability of the Chi-squared test is significant ($p < 0.01$). The correlation magnitude is moderate ($r0 = 0.42$) and significant, which is reflected by the *95%CI* [0.34; 0.49] that does not include the value 0, suggesting a positive relationship.

Discussion

We found six sources that included individuals with some limiting condition, assisted in clinics or at home. Only three sources complied with general community settings. This means that the individuals who participated in these studies were considered able to live independently and without significant limitations. Although most participants were community-dwelling it is not possible to consider that they were not affected by pathologies associated with depression or that they did not have any mental/social difficulties (Aziz & Steffens, 2013). Nevertheless, we chose to understand that these participants were healthier than those included in clinical samples. This is in line with the assertions of Buysse (2014), shifting the focus from sickness to health is a promising prospect for research, namely for the investment in health promotion and public education initiatives.

In this meta-analysis depression was associated with subjective sleep disturbances, aspect corroborated by past studies (e.g., Dzierzewski et al., 2015; Maglione et al., 2012; Orhan et al., 2012; Park et al., 2013; Potvin, Lorrain, Belleville, Grenier, & Préville, 2014; Rashid & Tahir, 2015). Given the role of depression on the subjective sleep quality, depression treatment should focus on both mental health and sleep quality (Buysse, 2004; Yao, Yu, Cheng, & Cheng, 2008). Sleep quality was associated with depression with a negative impact on health. However, as stated by Buysse (2014), sleep health has become an important tool to understand potential innovations in health interventions. Future researches should involve new partnerships between the health care delivery systems, public health and social services sectors, as well as new methods to assess the sleep health status in the community and to provide targets for intervention.

The development of strategies to improve the sleep quality and life in the elderly emphasizes the continued importance of mental health evaluation (Wu et al., 2012). Recently, sleep hygiene education has revealed itself as an intervention strategy with the potential to cover the growing public health concerns regarding the increase of sleep complaints in the general population (Irish,

Kline, Gunn, Buysse, & Hall, 2015). However, there is still a shortage of replications about the use and relevance of sleep hygiene components (Irish et al., 2015).

The limitation of this study was the difficulty to collect due to the restrictions imposed by the inclusion criteria, e.g., the studies were limited to elderly population. It is important to conduct a meta-analysis encompassing all ages with the objective of applying a meta-regression on the relationship between sleep quality and depression.

In conclusion, there was a relationship between depression and sleep quality indicating the importance of paying close attention to the sleep quality of older people with depressive symptoms. An older person's lack of good sleep quality is probably associated with depressive symptoms.

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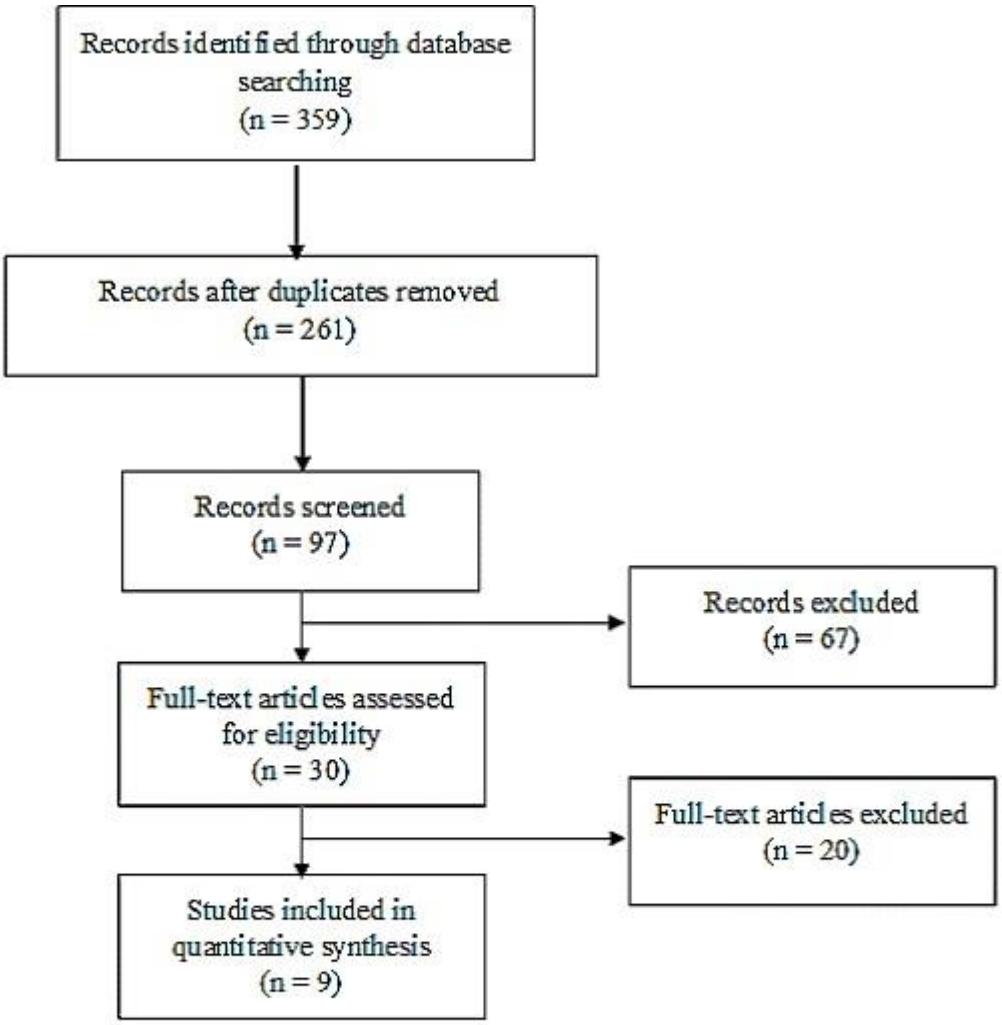

Fig. 1 Phases of the collection of studies. The number (*n*) of studies that remained in the sample is presented in each phase.

Source	Setting	*N*	Average age	Instruments		*r*
				Depression	Sleep Quality	
Valentine et al. (2011)	CD	182	69.2	GDS	PSQI	0.306***
Martin et al. (2010)	CP	121	85.3	GDS	PSQI	0.268**
McHugh et al. (2011)	CP	636	72.0	CES-D	PSQI	0.415***
Park et al. (2013)	CP	157	74.0	GDS	PSQI	0.54***
Shin et al. (2010)	CD	213	73.3	GDS	PSQI	0.43***
Chang et al. (2014)	CP	2040	75.6	GDS	PSQI	0.37***
Yang et al. (2015)	CP	87	65.2	HADS-D	PSQI	0.54**
		87	65.2	HADS-D	PSQI	0.74**
Orhan et al. (2012)	CP	73	74.0	GDS	ESS	0.091
					PSQI	0.231*
Wu et al. (2012)	CD	100	74.7	TDQ	PSQI	0.517***
Total		3609	73.0			

Fig. 2. Summary of the characteristics of the studies included in the meta-analysis ($N = 9$). N = Sample; $^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$; CD = Community-dwelling; CP = Clinical population; GDS = Geriatric Depression Scale; CES-D = Center for Epidemiological Studies Depression scale; HADS-D = Hospital Anxiety and Depression scale; TDQ = Taiwanese Depression Questionnaire; PSQI = Pittsburgh Sleep Quality Index; r = Pearson Correlation Coefficient.

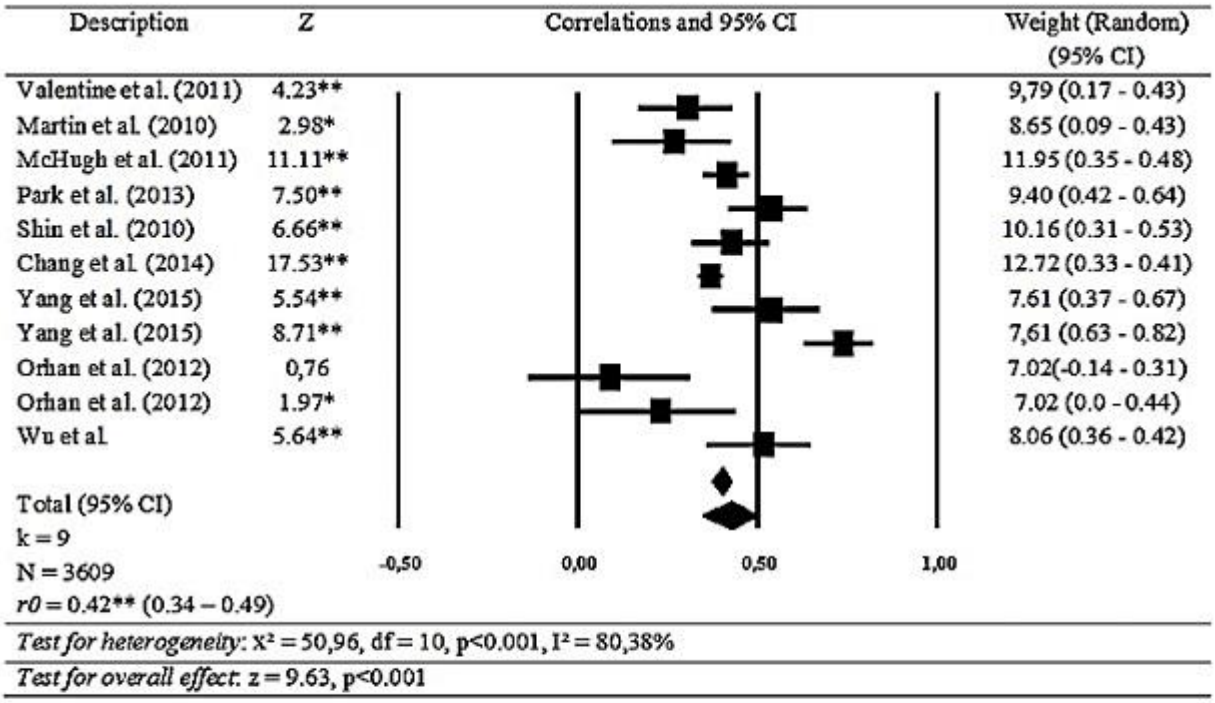

Fig. 3 Summary of the results between sleep quality and depression in older adults. $^{**}p < .001$; $^{*}p < .05$; k = number of independent samples; N = number of participants; $r0$ = weighted mean of the observed effect size; χ^2 = chi-squared test; df = freedom degrees; p = probability of Chi-squared test; I^2 = explained variance of the effect size observed; Z = standardized overall effect (random model).