

## ORIGINAL ARTICLE

# Sleep correlates of depression and anxiety in an elderly Asian population

Junhong YU,<sup>1,3,4</sup> Iris RAWTAER,<sup>1</sup> Johnson FAM,<sup>1</sup> Min-Jun JIANG,<sup>2</sup> Lei FENG,<sup>2</sup> Ee Heok KUA<sup>1,2</sup> and Rathi MAHENDRAN<sup>1,2</sup>

<sup>1</sup>Department of Psychological Medicine, National University Hospital, <sup>2</sup>Department of Psychological Medicine, Yong Loo Lin School of Medicine, National University of Singapore, Singapore, <sup>3</sup>Laboratory of Neuropsychology, <sup>4</sup>Institute of Clinical Neuropsychology, The University of Hong Kong, Hong Kong, China

*Correspondence:* Mr Junhong Yu M.Soc.Sci., Institute of Clinical Neuropsychology, Room 309, 3/F, The Hong Kong Jockey Club Building for Interdisciplinary Research, 5 Sassoon Road, Pokfulam, Hong Kong. Email: gerardyu87@gmail.com

Dr Lei Feng PhD, Department of Psychological Medicine, National University of Singapore, NUHS Tower Block, 1E Kent Ridge Road, Singapore 119228, Singapore. Email: pcmfl@nus.edu.sg

Received 24 October 2014; revision received 9 March 2015; accepted 11 May 2015.

**Key words:** anxiety, Asia, depression, elderly population, sleep problems.

## INTRODUCTION

Sleep has important implications in geriatric mental health. Sleep architecture changes as a result of the ageing process. For instance, relative to younger adults, older adults have a lower percentage of deep sleep and rapid eye movement sleep, decreased sleep efficiency, and increased sleep latency.<sup>1</sup> Compounded by the health problems associated with old age, this contributes to frequent sleep problems among the elderly.<sup>2</sup> Such sleep problems are not only precursors to psychiatric illness, but they may exist as consequences as well.<sup>3,4</sup> Most notably, previous research has established a bidirectional relationship between depression/anxiety and sleep problems.<sup>5,6</sup> For instance, both depression and anxiety are associated with a number of adverse changes to the sleep architecture.<sup>7,8</sup> Furthermore, the presence of sleep disturbances doubles the risk of developing depression in non-depressed individu-

## Abstract

**Background:** Research looking at the association between sleep and psychiatric symptoms in elderly Asian populations is lacking. The present study examines the sleep correlates of depression and anxiety in a sample of cognitively healthy older adults.

**Methods:** The Geriatric Depression Scale, Geriatric Anxiety Inventory, and the Pittsburgh Sleep Quality Index were administered to a community sample of elderly participants ( $n = 107$ ; 81 women;  $M_{age} = 71.3$  years,  $SD = 5.7$ )

**Results:** Geriatric Depression Scale and Geriatric Anxiety Inventory scores are both significantly correlated with sleep disturbance. Geriatric Depression Scale scores are uniquely associated with daytime dysfunction, and Geriatric Anxiety Inventory scores are uniquely associated with perceived sleep quality, sleep latency, and global Pittsburgh Sleep Quality Index scores.

**Conclusions:** Depression and anxiety in a cohort of elderly Asian subjects are associated with a number of sleep-related issues; both are related to a somewhat different profile of sleep problems.

als and new anxiety episodes.<sup>6,9</sup> Another major implication relates to the fact that psychiatric disorders comorbid with sleep problems are associated with greater psychological burden and complications, such as increased suicidality and risk of recurrent psychiatric episodes.<sup>10,11</sup>

Here in Asia, sleep problems have a further significance in the clinical practice. As widely documented, considerable variation exists in the presentation of psychiatric illness across cultures.<sup>12</sup> Relative to Caucasians, Asians tend to somatize psychological distress.<sup>13</sup> Perhaps, due to the stigma associated with mental illness in Asia, reporting somatic symptoms is perceived as a more acceptable way of communicating distress than reporting psychological symptoms.<sup>14</sup> Some evidence also suggests that clinicians are more receptive to somatic complaints when attending to patients of Asian ethnicities.<sup>15</sup> Taken together, the importance of looking at sleep problems, one such

somatic symptom commonly reported in psychiatric disorders, cannot be understated in the Asian mental health context.

Although a few studies involving elderly populations in Asia have found that depressed participants report sleep-related issues such as poorer sleep efficiency, sleep disturbances, breathing discomfort, coldness and pain, increased sleep latency, poor subjective sleep quality, and the use of sleep medications,<sup>16,17</sup> the sleep problems associated with anxiety symptoms have not been sufficiently studied in these populations. Certainly, more research is required for a better understanding of the relationship between sleep problems and psychiatric symptoms, and to aid clinicians in diagnostic decisions and treating psychiatric disorders in which sleep problems are implicated.

With these considerations in mind, the present study aims to examine sleep-related correlates of depression and anxiety in an elderly Asian population. As the self-evaluation of one's sleeping habits hinges upon one's retrospective recall ability, cognitively impaired participants were excluded to avoid inaccurate responses. Because of the bidirectional nature of the relationship between sleep problems and, depression and anxiety, a correlational approach was adopted. Additionally, age and gender were controlled for, as evidence suggests that they may confound such relationships.<sup>17</sup>

## METHODS

### Participants

A total of 107 participants (81 women;  $M_{\text{age}} = 71.3$  years,  $SD = 5.7$ ) were recruited from the Aging in a Community Environment Study (ACES) cohort in geographically defined areas in Jurong, Singapore, based on the following inclusion criteria: (i)  $\geq 60$  years of age; (ii) Mini-Mental State Examination score  $\geq 24$  as assessed by a trained nurse; and (iii) willing and able to provide written informed consent.

All participants were of Chinese ethnicity. Most participants were married, retired, and living with their families and had at least a primary school education. Participants' detailed characteristics are reported in Table 1. Corresponding data from a national census,<sup>18</sup> where available, are also shown in Table 1 to provide information relating to the representativeness of the sample.

**Table 1** Participants' characteristics

Characteristic	Frequency†	(%)	Census data‡ (%)
Education			
None	24	22.6	34.6
Primary	44	41.5	37.5
Secondary and beyond	38	35.9	27.9
Marital status			
Single	6	5.8	6.2
Married	61	59.2	52.5
Divorced/separated	8	7.8	4.4
Widowed	28	27.2	36.9
Employment status			
Full-time employment	4	3.8	–
Part-time employment	9	8.7	–
Homemaker	25	24.3	–
Retired	64	61.2	–
Living arrangements			
Alone	22	21.4	15.6
With others	81	78.6	84.4
Housing type§			
One- or two-room PH	8	7.8	8.2
Three-room PH	21	20.4	24.5
Four- or five-room or bigger PH	70	67.9	53.5
Private housing	4	3.9	13.6
Medical conditions¶ (n)			
None	14	13.6	–
1	16	15.5	–
2	26	25.2	–
>2	47	45.6	–

†Frequency may not add up to 107 due to missing responses. ‡Distribution of subgroups based upon 2011 census data (where available),<sup>18</sup> after adjusting for gender proportions in the current sample. §Housing type is used as a rough gauge for socioeconomic status (i.e. one- or two-room PH is the lowest tier; private housing is the highest tier). ¶Examples of reported medical conditions include high blood pressure, high cholesterol, and diabetes. PH, public housing.

This study was approved by the National University of Singapore's Institutional Review Board. Study recruitment and assessment were conducted from March 2013 to March 2014. Each participant was assigned a unique number for identification; no personal identifiers were used in the analysis.

### Measures

The original 15-item version of the Geriatric Depression Scale (GDS) was used to index the level of depression.<sup>19,20</sup> This version of the GDS has been validated and has demonstrated good psychometric properties in the local context.<sup>21</sup> The Geriatric Anxiety Inventory (GAI),<sup>22</sup> consisting of 20 agree/disagree items, was used to assess for anxiety symptoms. The GAI has recently shown good psychometric properties in a population similar to the present population.<sup>23</sup>

Sleep-related variables were assessed by the Pittsburgh Sleep Quality Index (PSQI).<sup>24</sup> The PSQI, consisting of 19 questions, assesses sleep components such as sleep duration, sleep latency, sleep disturbance, sleep efficiency, quality of sleep, daytime dysfunction, and use of sleep medications. Each of these is scored from 0 to 3; a global score is obtained by totalling the component scores. The PSQI has been validated and has demonstrated good psychometric properties in an ethnically similar population.<sup>25</sup> It should be noted that unlike other commonly used depression and anxiety measures such as the Beck Depression Inventory and the Geriatric Anxiety Scale, neither the GDS nor GAI includes items assessing sleep disturbances. This enabled us to avoid a scenario in which a significant correlation was yielded simply because the questionnaires measured the same factor/construct.

For all three measures, higher scores reflect greater severity of problems. As participants may be proficient in either English or Chinese, questionnaires included the original items in English as well as validated Chinese translations,<sup>23,25,26</sup> for every item, the original English text and Chinese translation were placed adjacent to each other.

### Procedures

Prior to the data collection, trained nurses visited homes in 30 public housing blocks in Jurong, a western district in Singapore, to invite potential participants to participate in a diet and healthy ageing study. Participants who expressed interest were subsequently invited to a community research centre. At the centre, written informed consent was obtained first, and then the test measures and a demographics questionnaire were administered by trained nurses. The trained nurses were present during the entire duration of the assessment to provide clarifications if participants had trouble understanding any of the items in the questionnaires. These measures were also administered verbally by these nurses in cases where participants were illiterate.

### Statistical analyses

Statistical significance was set at  $P < 0.05$  for all analyses. Shapiro–Wilk tests suggested that the data violated assumptions of normality ( $P < 0.05$ ). As such, partial Spearman's rho ( $\rho$ ) was used to examine correlations between the variables; age and gender were

**Table 2** Descriptive statistics of all measures

Measure	Mean	SD	Lowest	Highest
GDS	5.9	1.8	3	13
GAI	1.8	3.5	0	19
PSQI components				
Sleep duration	0.8	1.0	0	3
Sleep disturbance	1.8	0.6	1	3
Sleep latency	1.5	0.7	1	3
Daytime dysfunction	1.2	0.5	1	3
Sleep efficiency	0.6	1.0	0	3
Sleep quality	0.8	0.8	0	3
Use of sleep medication	<0.1	0.2	0	2
Global PSQI Score	6.5	2.8	3	16

GAI, Geriatric Anxiety Inventory; GDS, Geriatric Depression Scale; PSQI, Pittsburgh Sleep Quality Index.

**Table 3** Correlation between sleep variables, GDS, and GAI scores, controlled for age and gender

Variable	GDS		GAI	
	$\rho$	$P$ -value	$\rho$	$P$ -value
PSQI components				
Sleep duration	-0.16	0.115	0.19	0.976
Sleep disturbance	0.25	0.013	0.46	<0.001
Sleep latency	0.03	0.801	0.21	0.047
Daytime dysfunction	0.23	0.027	0.16	0.134
Sleep efficiency	0.07	0.477	0.15	0.152
Sleep quality	0.20	0.058	0.28	0.006
Use of sleep medication	-0.16	0.105	-0.11	0.299
Global PSQI Score	0.18	0.090	0.41	<0.001

GAI, Geriatric Anxiety Inventory; GDS, Geriatric Depression Scale; PSQI, Pittsburgh Sleep Quality Index;  $\rho$ , Spearman's rho.

controlled for. All analyses were carried out using SPSS, IBM, Chicago, IL, USA version 20 software.

## RESULTS

After incomplete responses were excluded, the number of valid responses for the GDS, GAI, and PSQI were 106, 106, and 99, respectively. The descriptive statistics are shown in Table 2. The partial correlation analyses revealed a number of significant relationships between PSQI variables and GAI and/or GDS scores (Table 3). GDS scores were significantly correlated with sleep disturbance and daytime dysfunction ( $P < 0.05$ ), whereas GAI scores were significantly correlated with sleep disturbance, sleep latency, sleep quality and global PSQI scores ( $P < 0.05$ ).

## DISCUSSION

The current report examined sleep-related correlates associated with depression and anxiety symptoms in

an elderly Asian community population. The results showed that depression and anxiety were associated with a number of sleep-related issues; both were associated with a different profile of sleep problems. Consistent with previous studies using similar populations,<sup>16,17</sup> higher levels of depression and anxiety symptoms corresponded to greater sleep disturbance. Beyond this, anxiety symptoms were uniquely associated with increased sleep latency and decreased sleep quality, whereas depression symptoms were uniquely associated with higher levels of daytime dysfunction. Such differences in the profile of sleep problems in an elderly population have yet to be documented in the literature and may reflect the aetiological differences related to sleep between depression and anxiety.<sup>27</sup>

This study has also noted a number of negative findings that were inconsistent with previous research. Most notably, unlike previous studies that found depression and anxiety to be associated with shorter sleep durations,<sup>16,28</sup> the current study found no such associations. Related to this, one intervention study involving patients diagnosed with depression and anxiety disorders found no significant changes in sleep duration post-treatment, even though depression and anxiety symptoms had decreased significantly.<sup>29</sup> Taken together, there is some evidence to suggest that sleep duration can be independent of depression and anxiety. Next, contrary to findings by Chang *et al.*,<sup>16</sup> sleep efficiency was not significantly related to depression or anxiety symptoms. However, it should be noted that weak correlations were observed in their study, and the larger sample size used in their study may have enabled greater sensitivity in detecting such associations. Lastly, we did not find a significant association between sleep latency and depression, which is inconsistent with the results reported by Chang *et al.* and Paudel *et al.*<sup>16,30</sup> In two other studies,<sup>17,31</sup> the prolonged sleep latency associated with depression was only present in men but not in women. Compared to the study by Chang *et al.*, women were overrepresented in the present study. Taken together, this suggests the possibility that gender may account for such differences in the relationship between depression and sleep latency. Future research should investigate prolonged sleep latency in depression or anxiety as a function of gender.

There were some limitations to the current study. The sample was relatively small and participants were

predominantly women. Despite this, the current sample was still generally representative of the general population in terms of the distribution of marital status, education levels, living arrangements, and housing types; these participants' characteristics were comparable to those of the general elderly population in Singapore (Table 1). Next, the absence of objective measurements of sleep (i.e. polysomnography) may cast doubts on the findings, as some evidence suggests that depressed individuals are inaccurate in recalling certain characteristics of their sleep.<sup>32</sup> Lastly, this was cross-sectional study; therefore, no conclusions on the direction of causation can be made.

Overall, this study brings attention to coexisting sleep-related issues in depression and anxiety. Given the methodological issues, it will be useful for further work in this area to clarify the relationship between sleep and both depression and anxiety in the elderly population, so as to inform clinicians on their diagnostic decisions, especially in view of the somatization of psychiatric symptoms in Asia.

## ACKNOWLEDGMENTS

The authors have no conflicts of interest to declare and received no financial support for this study. The authors would like to thank the Training and Research Academy at Jurong Point, Presbyterian Community Services, Alice Lim Memorial Fund, NUS Virtual Institute for the Study of Aging, Kwan Im Thong Hood Cho Temple, and all participants for their support in this study.

## REFERENCES

- Ohayon MM. Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: developing normative sleep values across the human lifespan. *Sleep* 2004; **27**: 1255–1273.
- Ancoli-Israel S, Ayalon L, Salzman C. Sleep in the elderly: normal variations and common sleep disorders. *Harv Rev Psychiatry* 2008; **16**: 279–286.
- Asarnow LD, Soehner AM, Harvey AG. Circadian rhythms and psychiatric illness. *Curr Opin Psychiatry* 2013; **26**: 566–571.
- Ford D, Kamerow D. Epidemiologic study of sleep disturbances and psychiatric disorders: an opportunity for prevention? *JAMA* 1989; **262**: 1479–1484.
- Palagini L, Baglioni C, Ciapparelli A, Gemignani A, Riemann D. REM sleep dysregulation in depression: state of the art. *Sleep Med Rev* 2013; **17**: 377–390.
- Jansson-Fröjmark M, Lindblom K. A bidirectional relationship between anxiety and depression, and insomnia? A prospective study in the general population. *J Psychosom Res* 2008; **64**: 443–449.

- 7 Costa I, Carvalho H, Fernandes L. Aging, circadian rhythms and depressive disorders: a review. *Am J Neurodegener Dis* 2013; **29**: 228–246.
- 8 Papadimitriou GN, Linkowski P. Sleep disturbance in anxiety disorders. *Int Rev Psychiatry* 2005; **17**: 229–236.
- 9 Baglioni C, Battagliese G, Feige B *et al.* Insomnia as a predictor of depression?: A meta-analytic evaluation of longitudinal epidemiological studies. *J Affect Disord* 2011; **135**: 10–19.
- 10 Singareddy R, Balon R. Sleep and suicide in psychiatric patients. *Ann Clin Psychiatry* 2001; **13**: 93–101.
- 11 Ohayon MM, Roth T. Place of chronic insomnia in the course of depressive and anxiety disorders. *J Psychiatr Res* 2003; **37**: 9–15.
- 12 Kirmayer LJ. Cultural variations in the response to psychiatric disorders and emotional distress. *Soc Sci Med* 1989; **29**: 327–339.
- 13 Ryder AG, Yang J, Zhu X *et al.* The cultural shaping of depression: somatic symptoms in China, psychological symptoms in North America? *J Abnorm Psychol* 2008; **117**: 300–313.
- 14 Zaroff CM, Davis JM, Chio PH, Madhavan D. Somatic presentations of distress in China. *Aust N Z J Psychiatry* 2012; **46**: 1053–1057.
- 15 Odell SM, Surtees PG, Wainwright NW, Commander MJ, Sashidharan SP. Determinants of general practitioner recognition of psychological problems in a multi-ethnic inner-city health district. *Br J Psychiatry* 1997; **171**: 537–541.
- 16 Chang KJ, Son SJ, Lee Y *et al.* Perceived sleep quality is associated with depression in a Korean elderly population. *Arch Gerontol Geriatr* 2014; **59**: 468–473.
- 17 Sukegawa T, Itoga M, Seno H *et al.* Sleep disturbances and depression in the elderly in Japan. *Psychiatry Clin Neurosci* 2003; **57**: 265–270.
- 18 Kang SH, Tan ES, Yap MT. National Survey of Senior Citizens 2011. Singapore, 2013.
- 19 Sheikh JI, Yesavage JA. Geriatric Depression Scale (GDS): recent evidence and development of a shorter version. *Clin Gerontol* 1986; **5**: 165–173.
- 20 Yesavage JA, Brink TL, Rose TL *et al.* Development and validation of a geriatric depression screening scale: a preliminary report. *J Psychiatr Res* 1983; **17**: 37–49.
- 21 Nyunt MSZ, Fones C, Niti M, Ng T-P. Criterion-based validity and reliability of the Geriatric Depression Screening Scale (GDS-15) in a large validation sample of community-living Asian older adults. *Aging Ment Health* 2009; **13**: 376–382.
- 22 Pachana NA, Byrne GJ, Siddle H, Koloski N, Harley E, Arnold E. Development and validation of the Geriatric Anxiety Inventory. *Int Psychogeriatr* 2007; **19**: 103–114.
- 23 Yan Y, Xin T, Wang D, Tang D. Application of the Geriatric Anxiety Inventory-Chinese Version (GAI-CV) to older people in Beijing communities. *Int Psychogeriatr* 2014; **26**: 517–523.
- 24 Buysse D, Reynolds III C, Monk T. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res* 1989; **28**: 193–213.
- 25 Tsai P-S, Wang S-Y, Wang M-Y *et al.* Psychometric evaluation of the Chinese version of the Pittsburgh Sleep Quality Index (CPSQI) in primary insomnia and control subjects. *Qual Life Res* 2005; **14**: 1943–1952.
- 26 Chan AC-M. Clinical validation of the geriatric depression scale (GDS): Chinese version. *J Aging Heal* 1996; **8**: 238–253.
- 27 Johnson EO, Roth T, Breslau N. The association of insomnia with anxiety disorders and depression: exploration of the direction of risk. *J Psychiatr Res* 2006; **40**: 700–708.
- 28 Park S, Cho MJ, Chang SM *et al.* Relationships of sleep duration with sociodemographic and health-related factors, psychiatric disorders and sleep disturbances in a community sample of Korean adults. *J Sleep Res* 2010; **19**: 567–577.
- 29 Mason EC, Harvey AG. Insomnia before and after treatment for anxiety and depression. *J Affect Disord* 2014; **168**: 415–421.
- 30 Paudel ML, Taylor BC, Diem SJ *et al.* Association between depressive symptoms and sleep disturbances in community-dwelling older men. *J Am Geriatr Soc* 2008; **56**: 1228–1235.
- 31 Maglione JE, Ancoli-Israel S, Peters KW *et al.* Depressive symptoms and subjective and objective sleep in community-dwelling older women. *J Am Geriatr Soc* 2012; **60**: 635–643.
- 32 Argyropoulos SV, Hicks J, Nash JR *et al.* Correlation of subjective and objective sleep measurements at different stages of the treatment of depression. *Psychiatry Res* 2003; **120**: 179–190.