

Correlates of Health-Related Quality of Life Among Chinese Older Adults with Mild Cognitive Impairment

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Purpose: This study aimed to assess the health-related quality of life (HRQoL) and identify the important correlates of HRQoL in older Chinese adults with mild cognitive impairment (MCI).

Patients and methods: A cross-sectional study design was adopted. A total of 204 older adults with MCI were enrolled in this study. HRQoL was evaluated by the Quality of Life–Alzheimer's disease. Hierarchical regression analysis was conducted to investigate the socio-demographic, disease-related, psychological, and behavioral factors associated with the HRQoL of individuals with MCI.

Results: Hierarchical regression analysis indicated that old age (Beta = -0.131, $p = 0.024$), low income (Beta = 0.128, $p = 0.032$), depressive symptoms (Beta = -0.564, $p < 0.001$), and poor sleep quality (Beta = -0.169, $p = 0.004$) were significantly associated with the HRQoL of individuals with MCI.

Conclusion: Caring for older Chinese adults with MCI should focus on sociodemographically disadvantaged groups with advanced age and low income. Rehabilitation programs that effectively alleviate depressive symptoms and improve sleep quality should be applied to older adults with MCI to enhance their HRQoL.

Keywords: mild cognitive impairment, health-related quality of life, correlates

Introduction

Along with the rapid worldwide population aging, there is a dramatic increase in the incidence and prevalence of cognitive impairment.¹ Mild cognitive impairment (MCI) is a transitional stage between normal aging and dementia, which is highly prevalent among older adults with an estimated prevalence ranging from 16% to 22.2% worldwide.^{2–4} Individuals with MCI constitute a high-risk group for developing dementia. It is estimated that 10.2% to 33.6% of the MCI patients convert to dementia annually,⁵ whereas the annual conversion rate to dementia is around 1–3% in overall older adults.^{6,7} Living with MCI has posed considerable challenges to one's daily function and psychosocial well-being.⁸ With the trajectory of MCI, the disease condition becomes increasingly complex and devastating. Therefore, promoting or maintaining their health-related quality of life (HRQoL) is considered as the ultimate treatment goal.⁹

HRQoL is concerned with health aspects including physical, psychological and social well-being and the effect of a specific illness or treatment on these parameters.¹⁰ QoL is an important health outcome for older adults with MCI, as it is multidimensional in nature, thus enabling the healthcare providers to take a comprehensive measurement of the disease and treatment effects. Moreover, HRQoL could be understood from the individual's

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perspective, thus providing valuable information that aids healthcare providers in their efforts to develop patient-centered approach to help those with MCI.

Numerous studies have explored the factors associated with HRQoL in the general elderly population; the existing literature suggest that various socio-demographic characteristics (old age, being female, being single, low education, low income, living alone), poor physical health, low psychological status, and sleep disturbance may compromise HRQoL in general older adults.^{11–13} Given the important role of HRQoL, emerging studies began to explore the factors related to HRQoL in MCI. However, few studies have provided a comprehensive analysis of the factors associated with HRQoL in MCI. The focus has been placed on identifying the independent relationship of HRQoL with either socio-demographic or disease-related variables.^{14–16}

For socio-demographic factors, Muangpaisan et al¹⁴ identified that poor education and low financial status are associated with a low HRQoL in patients with MCI in Thailand. For disease-related factors, Hsiao et al¹⁵ examined the relationship between cognitive function and HRQoL in Taiwanese older adults with MCI and identified the positive relationship; Kameyama et al¹⁶ explored the relationship between functional abilities and HRQoL in Japanese older adults with MCI and found a positive relationship.

Although considerable research efforts have been devoted to understanding the correlates of HRQoL in MCI, less attention has been given to the role of psychological and behavioral factors in influencing HRQoL in MCI. Depressive symptoms are considered as the most predominant psychological symptoms in MCI, with the reported prevalence ranging from 22.3% to 63.3%.¹⁷ Depressive symptoms not only affect mood but also worsen daily function, increase morbidity, and complicate the disease management of individuals with MCI.^{18,19} Older adults with MCI also experience sleep disturbance more often than general older adults, with an estimated prevalence of 38.3–63%.^{20–22} Sleep disturbance causes fatigue, induces emotional distress, and interferes with daily living.²³ Therefore, both depressive symptoms and sleep disturbance may play an important role in determining the HRQoL of older adults with MCI. However, the effect of depressive symptoms and sleep disturbance on the HRQoL among older adults with MCI has yet to be investigated.

Despite the important role of HRQoL in MCI, HRQoL is still poorly understood among older adults with MCI in mainland China, which has the largest aging population and faces a great burden of cognitive impairment. HRQoL is also a culture-specific health outcome.²⁴ To tailor interventions that

could meet the complex health needs of Chinese older adults with MCI, this study aims to investigate the socio-demographic, disease-related, and physical, psychological, and behavioral-related correlates of HRQoL in MCI.

Methods

Ethics Statement

This study was approved by the Survey and Behavioral Research Ethical Committee of the Chinese University of Hong Kong (No. SBREC-20160602). This study was conducted in accordance with the Declaration of Helsinki. Written informed consent was obtained from each participant. All information was kept strictly confidential.

Study Design and Sample

A cross-sectional study design was adopted. Eligible participants were community-dwelling older adults screened with MCI aged 60 or above. MCI was defined by scoring 19–26 on the Montreal Cognitive Assessment (Chinese version, MoCA-C). MoCA is a tool specifically developed for MCI screening;²⁵ it contains subtests for memory, attention, executive function, language, visuospatial ability, and orientation to obtain a compressive view of one's cognitive function.²⁵ By using a cut-off score of 19 and 26, the MoCA-C gives the optimal sensitivity and specificity in differentiating patients with MCI from those with dementia (sensitivity: 93.2% & specificity: 71.7%) and intact cognitive function (sensitivity: 92.4% & specificity: 88.4%), respectively.²⁶ The influence of education on cognitive function was adjusted by adding one point to those with less than 6 years of education.²⁷

Participants were excluded if they met the following criteria: (1) individuals who scored below 19 on MoCA-C or have a diagnosis of dementia; (2) individuals who have any serious neurological disorders that influence the cognition (e.g., stroke, Parkinson's disease and head damage); (3) individuals who have impaired hearing or vision that may inhibit them from giving consent and answering the questionnaires.

Regarding sample size estimation, by conservatively estimating a medium effect size ($R^2=0.13$) of the relationship between the independent variable and the group of dependent variables,²⁸ 10 independent variables were considered to be included in the multiple regression model. Thus, a minimum of 134 participants were required in the multiple regression model in this study.

Data Collection

Data collection took place in a public community healthcare center in the city of Hangzhou, Southeast China from

June 2016 to May 2017. Participants for this study were recruited via the following: 1) study posters attached with the contact information of the researchers; 2) health talks held at the community healthcare center; 3) and word of mouth by the researchers. Individuals who show interest, including those who were self-referred or referred by their family members and general practitioners, were invited for an in-person interview to screen for study eligibility. Finally, a convenience sample of 204 older adults who were detected with MCI and met the inclusion criteria were recruited. Three research nurses consented and collected data from the eligible participants without the presence of the family members of the participants. Data were collected in the form of structured interview, by which the research nurses filled the questionnaires according to the responses of the participants to ensure internal validity.

Measures

Health-Related Quality of Life

The HRQoL was measured by the Quality of Life –Alzheimer’s disease (Chinese version, QOL-AD-C). QOL-AD is a 13-item questionnaire that was specifically designed to assess HRQoL among those with cognitive impairment.⁹ It uses simple and straightforward language and includes assessments of behavioral competence, the objective environment, psychological well-being, and perceived life quality, which are important for persons affected by cognitive impairment.⁹ Responses are structured in a four-choice format that is consistent across all questions, and all items are rated based on the respondent’s current HRQoL. Overall scores were computed by summing the 13 items, for a total possible score ranging from 13 to 52, with higher scores indicating better HRQoL. Its Cronbach’s alpha in this study was 0.800.

Potential Correlates of HRQoL

The correlates to be investigated included socio-demographic factors (age, gender, education, marital status, income, living conditions), disease-related factors (cognitive function and functional abilities), depressive symptoms and sleep quality. A socio-demographic sheet was designed to obtain the socio-demographic data. Cognitive function was indicated with the MoCA score. Functional status was assessed by Functional Activities Questionnaire (FAQ-C). FAQ evaluates complex functional and social behaviors of older adults that are probably impaired during early cognitive decline stage,²⁹ which are not covered by the Lawton Instrumental Activities of Daily Living scale (IADL). Therefore, FAQ shows better sensitivity than IADL in detecting functional impairment in those with

early cognitive impairment (sensitivity: 0.85 vs. 0.57).²⁹ Depressive symptoms were assessed by the 30-item Geriatric Depression Scale (Chinese version, GDS-C). The scale results of using dichotomous questions presented a total score ranging from 0 to 30, with high scores representing highly depressive symptoms.³⁰ A cut-off score ≥ 10 gives a sensitivity of 0.94 and a specificity of 0.80 for screening clinical level of depression among elderly people.³⁰ Its Cronbach’s alpha in this study was 0.784. Sleep quality was measured by the Pittsburgh Sleep Quality Index (Chinese version, PSQI-C). It provides a global sleep quality score (maximum =21) based on 7 components (maximum sub-scale score=3) including sleep quality, latency, duration, efficiency, disturbance, use of sleep medication, and daytime dysfunction due to poor sleep quality.³¹ A global score ≥ 6 yielding a diagnostic sensitivity of 90% and specificity of 67% in differentiating good and poor sleepers in Chinese older adults.³² Its Cronbach’s alpha in this study was 0.736.

Statistical Analysis

Statistical analysis was performed with SPSS version 22. Appropriate descriptive statistics were used to summarise the characteristics of the participants. Bivariate correlations between the potential correlates and HRQoL were calculated using Pearson’s correlation and Spearman’s Rho for the continuous and ordinal variables, respectively. For the discrete variables (gender, residence, and marital status), independent t-tests were used to examine for any significant difference in the HRQoL between participants with different characteristics. Hierarchical regression analysis was further conducted to identify the independent correlates of HRQoL in MCI. The first level included socio-demographic characteristics (age, gender, education, marital status, income, and residence). At the second level, the disease-related factors (cognitive function and functional status) were entered. Next, depressive symptoms (GDS mean) were entered. The last level included sleep quality (PSQI mean). Regression diagnostics were performed to determine whether relevant statistical assumptions were met. The significance level α was set at 0.05, and all comparisons were two-tailed.

Results

Characteristics of the Participants

A total of 204 older adults screened with MCI were recruited into this study. The characteristics of the participants are presented in Table 1. The mean age of the participants was 75.97 years, and about 78.4% were female. Above half of the participants (56.9%) have no less than 6 years’ education. About 70% of the participants had monthly income below the average level

Table 1 Characteristics of the Participants (N=204)

Characteristics	Values
Age	75.97±6.69
Gender	
Male	44 (21.6%)
Female	160 (78.4%)
Marital status	
Married	142 (73.8%)
Single	62 (26.1%)
Education level	
Below middle school	88 (43.2%)
Middle school and above	116 (56.8%)
Residence	
Living alone	51 (21.5%)
Living with others	153 (78.5%)
Monthly income ^a	
Less than 4000 CNY	140 (68.6%)
Above 4000 CNY	64 (31.4%)
Cognitive function (MoCA)	22.47±1.94
Functional status (FAQ)	
0	136 (66.7%)
1–5	68 (33.3%)
Level of depressive symptoms (GDS)	5.68±3.87
Presence of clinical depressive symptoms (GDS≥10)	52 (25.49%)
Sleep quality (PSQI)	8.92±4.13
Presence of poor sleepers (PSQI≥6)	152 (74.5%)

Note: ^a1 US Dollar=6.9 CNY.

Abbreviations: MCI, mild cognitive impairment; CNY, Chinese yuan; GDS, geriatric depression scale; MoCA, montreal cognitive assessment; FAQ, functional activities questionnaire; PSQI, pittsburgh sleep quality index.

in the local city (i.e., 4000 CNY according to the public data). Less than 30% of the participants were unmarried, and 21.5% of the participants lived alone. One-third of the participants indicated the presence of functional impairment. The mean MoCA score was 22.47 (SD=1.94). The mean GDS score was 5.69 (SD=3.87); using a cut-off score of 10, 25.1% of the participants were classified as having possible clinical depression. The mean PSQI score was 8.92 (SD=4.13); using a cut-off score of 6, 74.5% of the participants were classified as having sleep disturbance.

Factors Associated with HRQoL in the Bivariate Analysis

Table 2 shows the results of bivariate correlation between HRQoL and socio-demographic factors, disease-related factors, depressive symptoms, and sleep quality of patients

with MCI. No high covariability (i.e., $r \geq 0.80$) existed between potential correlates. A lower level of HRQoL was related to worse cognitive function ($r = 0.139$, $p < 0.05$), lower functional abilities ($r = -0.417$, $p < 0.01$), more depressive symptoms ($r = -0.651$, $p < 0.01$) and poorer sleep quality ($r = -0.345$, $p < 0.01$). For the discrete variables (gender, residence, and marital status), no significant difference in the HRQoL between participants with different characteristics was detected.

Factors Associated with HRQoL in the Hierarchical Regression Analysis

As shown in Table 3, socio-demographic factors accounted 4% of the variance of HRQoL ($p = 0.233$). Adding cognitive function and functional abilities in the second block accounted for additional 17.6% of the variance of HRQoL ($p < 0.001$). Depressive symptoms further significantly accounted for 25.3% of the variance of HRQoL ($p < 0.001$). Adding sleep quality to the final model accounted for additional 3.8% of the variance of HRQoL ($p = 0.004$). In the final model, older age (Beta = -0.131 , $p = 0.024$), lower income (Beta = 0.128 , $p = 0.032$), more depressive symptoms (Beta = -0.564 , $p < 0.001$) and poorer sleep quality (Beta = -0.169 , $p = 0.004$) significantly contributed to a lower level of HRQoL. The total model explained 49.1% of the variance in HRQoL in MCI. The comparatively high regression coefficient of depressive symptoms indicated its more significant role in affecting HRQoL in MCI.

Discussion

This study aimed to assess the level of HRQoL of Chinese older adults with MCI and systematically examine the factors related to the HRQoL in this population. The level of HRQoL in Chinese older adults with MCI as measured by the QoL-AD was comparable to that in Portuguese older adults with MCI (31.69 vs. 32.1). Old age, low income, depressive symptoms, and poor sleep quality were identified as significant correlates of HRQoL in Chinese older adults with MCI.

The positive association between income and HRQoL in this study was consistent with the study findings of Muangpaisan et al,¹⁴ which may be explained by the financial stress and the impact of low income on access to care.³³ Age was identified as a significant correlate in our work but not in the study of Muangpaisan et al,¹⁴ possibly because of the difference in sample size and participants' characteristics between these studies. Our sample size was larger than that in

Table 2 Bivariate Correlations Between Potential Correlates and HRQoL in MCI (N=204)

		1	2	3	4	5	6	7	8
1	Age	1.00							
2	Education	-0.117	1.00						
3	Income	0.144*	0.402**	1.00					
4	MoCA	-0.217**	0.338**	0.127	1.00				
5	FAQ	0.114	-0.037	0.058	-0.114	1.00			
6	GDS	0.038	-0.207**	-0.069	-0.099	0.480**	1.00		
7	PSQI	0.040	-0.020	-0.070	-0.207**	0.279**	0.326**	1.00	
8	QoL-AD	0.023	0.132	-0.051	0.139*	-0.417**	-0.651**	-0.345**	1.00

Note: * $P < 0.05$. ** $P < 0.001$.

Abbreviations: MoCA, montreal cognitive assessment; FAQ, functional activities questionnaire; GDS, geriatric depression scale; PSQI, Pittsburgh sleep quality index; QoL-AD, quality of life - Alzheimer's disease.

Table 3 Results of the Hierarchy Regression Analysis (N=204)

Variables	Step 1		Step 2		Step 3		Step 4	
	Beta	p	Beta	p	Beta	p	Beta	p
Age	-0.080	0.300	-0.131	0.067	-0.121	0.040	-0.131	0.024
Being female	-0.004	0.956	-0.037	0.609	0.040	0.505	0.081	0.178
Being single	-0.077	0.322	-0.067	0.350	-0.082	0.161	-0.101	0.083
Higher education	0.182	0.025	0.131	0.085	0.033	0.603	0.062	0.326
Living alone	-0.032	0.662	0.007	0.914	-0.059	0.297	-0.076	0.170
Higher income	0.144	0.074	-0.127	0.084	0.120	0.046	0.128	0.032
Cognitive function (MoCA)			0.071	0.312	0.087	0.130	0.055	0.345
Functional status (FAQ)			-0.416	<0.001	-0.114	0.066	-0.082	0.189
Depressive symptoms (GDS)					-0.599	<0.001	-0.564	<0.001
Sleep quality (PSQI)							-0.169	0.004
R ²	4%		21.6%		46.9%		49.1%	
Change in R ²			17.6% ($p < 0.001$)		25.3% ($p < 0.001$)		3.8% ($p = 0.004$)	

Abbreviations: Beta, standardized coefficient; MoCA, montreal cognitive assessment; FAQ, functional activities questionnaire; GDS, geriatric depression scale; PSQI, Pittsburgh sleep quality index.

the previous study ($n=204$ vs. 85), and the participants in our study were older than their participants (mean age=75.97 vs. 66.7), thereby enabling us to detect the impact of older age on HRQoL. Indeed, old age is associated with worse disease conditions and more restricted social engagement, leading to reduced level of HRQoL.³⁴ The socio-demographic correlates identified here indicate that healthcare providers should make an effort to approach these socio-demographically disadvantaged groups to improve their HRQoL.

Bivariate analysis revealed that cognitive function and functional abilities were significantly associated with HRQoL. However, this association was not found in multiple hierarchy analysis when depressive symptoms were

added to the regression model. This finding was consistent with the reviewed literature. Kameyama et al¹⁶ performed bivariate analysis and identified the positive relationship between functional abilities and HRQoL in MCI. However, Teng et al³⁵ failed to identify the relationship between functional abilities and HRQoL in MCI when depressive symptoms were included in multiple regression analysis. These findings likely suggested that depressive symptoms considerably affected the cognitive and functional performance of old adults with MCI, which was supported by other studies.^{36,37}

The level of depressive symptoms was identified as the strongest correlate of HRQoL in MCI. Indeed, psychological

health constitutes an important domain of HRQoL; moreover, the impact of depressive symptoms extends to different aspects of one's life experience and significantly compromises the HRQoL of older adults with MCI. Depressive symptoms are not only emotionally distressing but also are accompanied by low energy, loss of interest and poor concentration, which has a greater impact on one's ability to carry out daily activities and engage in social activities than that reported with other chronic physical illnesses.³⁸ Furthermore, depressive symptoms have been identified as one of the most prominent risk factors for cognitive impairment in MCI.³⁹ Together, these negative impacts are detrimental to the well-being of older adults with MCI. Despite the prominent effect of depressive symptoms on HRQoL, they have been neglected in the care for MCI population. According to a systematic review on psychosocial interventions for patients with cognitive impairment, no intervention studies have addressed the psychological well-being of individuals in the MCI population.⁴⁰ Effective assessment and management strategies for depression in this increasing cohort of the population are necessary to promote their HRQoL. In terms of detecting depressive symptoms, older Chinese with depressive symptoms more likely to present somatic symptoms rather than verbalize their negative emotions, possibly hindering them from making a complaint.⁴¹ Health education in this regard should also be provided to patients with MCI and their caregivers to facilitate the timely detection and prompt management of depressive symptoms. In terms of managing depressive symptoms, evidence-based cognitive-behavioral interventions⁴² and exercise therapy⁴³ could be incorporated into care programs for MCI to reduce depressive symptoms. Meaningful and enjoyable social activities can be incorporated to encourage patients with MCI to actively participate in various psychological rehabilitation programs.⁴⁴

Sleep quality was first identified as an important correlate of HRQoL in MCI. Previous studies conducted in general and chronic disease populations supported the link between poor sleep and impaired HRQoL.⁴⁵⁻⁴⁷ Poor sleep causes a lack of energy at daytime⁴⁸ and negatively influences daily function.⁴⁹ In addition, poor sleep is associated with increased negative mood.⁵⁰ These effects considerably diminish the level of HRQoL in this vulnerable clinical cohort. In the present study, the prevalence of sleep disturbance in Chinese older adults with MCI reached 74.5%, which confirmed the high prevalence of sleep disturbance in patients with MCI reported in

previous studies.^{20,21} Sleep disorders should be properly managed for the care of older adults with MCI to improve or maintain their HRQoL. Non-pharmacological treatments have been recommended as the most appropriate initial strategy. Cognitive behavioral treatment, which includes sleep hygiene education, stimulus control, sleep restriction, relaxation training, and cognitive therapy, is highly effective in managing sleep disorders in the general population⁵¹ and older adults with dementia.⁵² Continuing education programs should be provided to healthcare providers to promote professional development in this regard and enhance the care for individuals with MCI.

Limitations

This study had several limitations. First, our data were obtained from a small convenience sample in one community center, which limits the generalizability of the study findings. Second, this study is cross-sectional in nature, so only association and not causal relationship could be established. Third, although we aimed to comprehensively investigate the potential correlates of HRQoL in MCI, the overall model explained 49.6% of the variance in HRQoL, indicating that other variables that were not assessed in this study might also contribute to HRQoL in MCI. Considering the subjective nature of HRQoL, further studies are recommended to additionally control intra-psycho variables and health beliefs and comprehensively understand the correlates of HRQoL in MCI.

Conclusion

This study revealed that Chinese older adults with MCI had impaired HRQoL. Old age, low income, depressive symptoms, and poor sleep were identified as potential correlates of HRQoL in MCI. The study findings helped target patient groups that were at a high risk of decreased HRQoL. Depressive symptoms and poor sleep among this vulnerable population should be effectively managed to promote or maintain their well-being.

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Disclosure

The authors report no conflicts of interest in this work.

References

- Bettio LEB, Rajendran L, Gil-Mohapel J, et al. The effects of aging in the hippocampus and cognitive decline. *Neurosci Biobehav Rev*. 2017;79:66–86. doi:10.1016/j.neubiorev.2017.04.030
- Petersen RC, Roberts RO, Knopman DS, et al. Prevalence of mild cognitive impairment is higher in men: the Mayo Clinic Study of Aging. *Neurology*. 2010;75(10):889–897. doi:10.1212/WNL.0b013e3181f11d85
- Ward A, Arrighi HM, Michels S, et al. Mild cognitive impairment: disparity of incidence and prevalence estimates. *Alzheimers Dement*. 2012;8(1):14–21. doi:10.1016/j.jalz.2011.01.002
- Lara E, Koyanagi A, Olaya B, et al. Mild cognitive impairment in a Spanish representative sample: prevalence and associated factors. *Int J Geriatr Psychiatry*. 2016;31(8):858–867. doi:10.1002/gps.4398
- Ward A, Tardiff S, Dye C, et al. Rate of conversion from prodromal Alzheimer's disease to Alzheimer's dementia: a systematic review of the literature. *Dement Geriatr Cogn Dis Extra*. 2013;3(1):320–332. doi:10.1159/000354370
- Satizabal CL, Beiser AS, Chouraki V, et al. Incidence of dementia over three decades in the framingham heart study. *N Engl J Med*. 2016;374(6):523–532. doi:10.1056/NEJMoa1504327
- Doblhammer G, Fink A, Zylla S, et al. Compression or expansion of dementia in Germany? An observational study of short-term trends in incidence and death rates of dementia between 2006/07 and 2009/10 based on German health insurance data. *Alzheimer's Res Ther*. 2015;7(1):66. doi:10.1186/s13195-015-0146-x
- Dean K, Wilcock G. Living with mild cognitive impairment: the patient's and carer's experience. *Int Psychogeriatr*. 2012;24(6):871–881. doi:10.1017/S104161021100264X
- Logsdon RG, Gibbons LE, McCurry SM, et al. Assessing quality of life in older adults with cognitive impairment. *Psychosom Med*. 2002;64(3):510–519. doi:10.1097/00006842-200205000-00016
- Jacobs JE. Quality of life: what does it mean for general practice? *Br J Gen Pract*. 2009;59(568):807–808. doi:10.3399/bjgp09X472854
- Tel H. Sleep quality and quality of life among the elderly people. *Neural Psychiat Brain Res*. 2013;19(1):48–52. doi:10.1016/j.npbr.2012.10.002
- Gouveia ÉRQ, Gouveia BR, Ihle A. Correlates of health-related quality of life in young-old and old-old community-dwelling older adults. *Qual Life Res*. 2017;26(6):1561–1569. doi:10.1007/s11136-017-1502-z
- Wada T, Ishine M, Sakagami T. Depression in Japanese community-dwelling elderly - Prevalence and association with ADL and QOL. *Arch Gerontol Geriatr*. 2004;39(1):15–23. doi:10.1016/j.archger.2003.12.003
- Muangpaisan W, Assantachai P, Intalapaporn S, et al. Quality of life of the community-based patients with mild cognitive impairment. *Geriatr Gerontol Int*. 2008;8(2):80–85. doi:10.1111/j.1447-0594.2008.00452.x
- Hsiao H-T, Li S-Y, Yang Y-P, et al. Cognitive function and quality of life in community-dwelling seniors with mild cognitive impairment in Taiwan. *Community Ment Health J*. 2016;52(4):493–498. doi:10.1007/s10597-016-9993-6
- Kameyama K, Tsutou A, Fujino H, et al. The relationship between health-related quality of life and higher-level functional capacity in elderly women with mild cognitive impairment. *J Phys Ther Sci*. 2016;28(4):1312–1317. doi:10.1589/jpts.28.1312
- Ismail Z, Elbayoumi H, Fischer CE, et al. Prevalence of depression in patients with mild cognitive impairment. *JAMA Psychiatry*. 2017;74(1):58. doi:10.1001/jamapsychiatry.2016.3162
- Lam LCW, Tam CWC, Chiu HFK, et al. Depression and apathy affect functioning in community active subjects with questionable dementia and mild Alzheimer's disease. *Int J Geriatr Psychiatry*. 2007;22(5):431–437. doi:10.1002/gps.1694
- Herrmann N, Lanctôt KL, Sambrook R, et al. The contribution of neuropsychiatric symptoms to the cost of dementia care. *Int J Geriatr Psychiatry*. 2006;21(10):972–976. doi:10.1002/(ISSN)1099-1166
- McKinnon A, Terpening Z, Hickie IB, et al. Prevalence and predictors of poor sleep quality in mild cognitive impairment. *J Geriatr Psychiatry Neurol*. 2014;27(3):204–211. doi:10.1177/0891988714527516
- Rozzini L, Vicini Chilovi B, Conti M. Neuropsychiatric symptoms in amnesic and nonamnesic mild cognitive impairment. *Dement Geriatr Cogn Disord*. 2008;25(1):32–36. doi:10.1159/000111133
- Lopez OL, Becker JT, Sweet RA. Non-cognitive symptoms in mild cognitive impairment subjects. *Neurocase*. 2005;11(1):65–71. doi:10.1080/13554790490896893
- Chen J-C, Espeland MA, Brunner RL, et al. Sleep duration, cognitive decline, and dementia risk in older women. *Alzheimers Dement*. 2016;12(1):21–33. doi:10.1016/j.jalz.2015.03.004
- Patrick DL, Deyo RA. Generic and disease-specific measures in assessing health status and quality of life. *Med Care*. 1989;27(3 Suppl):S217–S232. doi:10.1097/00005650-198903001-00018
- Nasreddine ZS, Phillips NA, Bedirian V, et al. The montreal cognitive assessment, MoCA: a brief screening tool for mild cognitive impairment. *J Am Geriatr Soc*. 2005;53(4):695–699. doi:10.1111/j.1532-5415.2005.53221.x
- Wen HB, Zhang ZX, Niu FS, et al. The application of montreal cognitive assessment in urban Chinese residents of Beijing. *Chin J Int Med*. 2008;47(1):36–39.
- Jin H, Ding B, Yang X, et al. The utility of Beijing version montreal cognitive assessment in ischemic cerebrovascular disease patients of Changsha area and the development of Changsha version montreal cognitive assessment. *Chin J Nerv Mentl Dis*. 2011;37(6):349–353.
- Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. New York: Routledge; 1988.
- Pfeffer RI, Kurosaki TT, Harrah CH, et al. Measurement of functional activities in older adults in the community. *J Gerontol*. 1982;37(3):323–329. doi:10.1093/geronj/37.3.323
- Smarr KL, Keefer AL. Measures of depression and depressive symptoms: beck depression inventory-II (BDI-II), center for epidemiologic studies depression scale (CES-D), geriatric depression scale (GDS), hospital anxiety and depression scale (HADS), and patient health questionnaire. *Arthritis Care Res (Hoboken)*. 2011;63(S11):S454–S466. doi:10.1002/acr.v63.11s
- Buyse DJ, Reynolds CF, Monk TH, et al. The pittsburgh sleep quality index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;28(2):193–213. doi:10.1016/0165-1781(89)90047-4
- 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(8):1943–1952. doi:10.1007/s11136-005-4346-x
- Arpey NC, Gaglioti AH, Rosenbaum ME. How socioeconomic status affects patient perceptions of health care: a qualitative study. *J Prim Care Community Health*. 2017;8(3):169–175. doi:10.1177/2150131917697439
- Efklides A, Kalaitzidou M, Chankin G. Subjective quality of life in old age in Greece: the effect of demographic factors, emotional state and adaptation to aging. *Eur Psychol*. 2003;8(3):178–191. doi:10.1027//1016-9040.8.3.178
- Teng E, Tassniyom K, Lu PH. Reduced quality-of-life ratings in mild cognitive impairment: analyses of subject and informant responses. *Am J Geriatr Psychiatry*. 2012;20(12):1016–1025. doi:10.1097/JGP.0b013e31826ce640
- Wang S, Blazer DG. Depression and cognition in the elderly. *Annu Rev Clin Psychol*. 2015;11(1):331–360. doi:10.1146/annurev-clinpsy-032814-112828
- Kim BJ, Liu L, Nakaoka S, et al. Depression among older Japanese Americans: the impact of functional (ADL & IADL) and cognitive status. *Soc Work Health Care*. 2018;57(2):109–125. doi:10.1080/00981389.2017.1397588
- Hays RD, Wells KB, Sherbourne CD, et al. Functioning and well-being outcomes of patients with depression compared with chronic general medical illnesses. *Arch Gen Psychiatry*. 1995;52(1):11. doi:10.1001/archpsyc.1995.03950130011002

39. Richard E, Reitz C, Honig LH, et al. Late-life depression, mild cognitive impairment, and dementia. *JAMA Neurol.* 2013;70(3):383. doi:10.1001/jamaneurol.2013.603
40. Noone D, Stott J, Aguirre E, et al. Meta-analysis of psychosocial interventions for people with dementia and anxiety or depression. *Aging Ment Health.* 2018;23(10):1–10.
41. Yu DSF, Lee DTF. Do medically unexplained somatic symptoms predict depression in older Chinese? *Int J Geriatr Psychiatry.* 2012;27(2):119–126. doi:10.1002/gps.2692
42. Sharon SS, Taki AC. Cognitive behavioral therapies in older adults with depression and cognitive deficits: a systematic review. *Int J Geriatr Psychiatry.* 2015;30(3):223–233. doi:10.1002/gps.4239
43. Schuch FB, Vancampfort D, Richards J, et al. Exercise as a treatment for depression: a meta-analysis adjusting for publication bias. *J Psychiatr Res.* 2016;77:42–51. doi:10.1016/j.jpsychires.2016.02.023
44. Croezen S, Avendano M, Burdorf A, et al. Social participation and depression in old age: a fixed-effects analysis in 10 European countries. *Am J Epidemiol.* 2015;182(2):168–176. doi:10.1093/aje/kwv015
45. Luyster FS, Dunbar-Jacob J. Sleep quality and quality of life in adults with type 2 diabetes. *Diabetes Educ.* 2011;37(3):347–355. doi:10.1177/0145721711400663
46. Magee CA, Caputi P, Iverson DC. Relationships between self-rated health, quality of life and sleep duration in middle aged and elderly Australians. *Sleep Med.* 2011;12(4):346–350. doi:10.1016/j.sleep.2010.09.013
47. Sandella DE, O'Brien LM, Shank LK, et al. Sleep and quality of life in children with cerebral palsy. *Sleep Med.* 2011;12(3):252–256. doi:10.1016/j.sleep.2010.07.019
48. Endeshaw YW. Do sleep complaints predict persistent fatigue in older adults? *J Am Geriatr Soc.* 2015;63(4):716–721. doi:10.1111/jgs.2015.63.issue-4
49. Kim J, Kim Y, Yang KI, et al. The relationship between sleep disturbance and functional status in mild stroke patients. *Ann Rehabil Med.* 2015;39(4):545. doi:10.5535/arm.2015.39.4.545
50. Cho HJ, Lavretsky H, Olmstead R, et al. Sleep disturbance and depression recurrence in community-dwelling older adults: a prospective study. *Am J Psychiatry.* 2008;165(12):1543–1550. doi:10.1176/appi.ajp.2008.07121882
51. Irwin MR, Cole JC, Nicassio PM. Comparative meta-analysis of behavioral interventions for insomnia and their efficacy in middle-aged adults and in older adults 55+ years of age. *Health Psychol.* 2006;25(1):3–14. doi:10.1037/0278-6133.25.1.3
52. McCurry SM, LaFazia DM, Pike KC, et al. Development and evaluation of a sleep education program for older adults with dementia living in adult family homes. *Am J Geriatr Psychiatry.* 2012;20(6):494–504. doi:10.1097/JGP.0b013e318248ae79

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