Original Article

The Factor Structure for the Geriatric Depression Scale in Screening Depression in Taiwanese Patients with Very Mild to Moderate Dementia☆

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S U M M A R Y

Background: To define the factor structures of the 30 items Geriatric Depression Scale (GDS-30) when assessing the depression in patients with very mild to moderate dementia.
Methods: A total of 240 pairs of patients with very mild to moderate dementia and their caregivers who visited the memory clinic of the medical center in Taiwan from July 2001 to October 2008 were surveyed. The depression of patients with dementia was evaluated using the Chinese version of the GDS-30. We analyzed the factor structure of the GDS with exploratory factor analysis using principle component factor analysis with orthogonal varimax rotation and used the Kaiser-Meyer-Olkin statistic to examine the sampling adequacy.
Results: The results show a 7-factor model including dysphoria, positive mood, apathy, hopelessness, social withdrawal, decreased concentration, and cognitive impairment.
Conclusion: The results of this study provide an important reference material and reveal the unobserved variables when using GDS-30 in screening depression of Chinese people with dementia.

1. Introduction

Of all the BPSDs in dementia patients, the rate of depressive symptomatology ranges from 39.1% to 70.0%[1]. A review of BPSD in Taiwan found the frequency of depression to be 22%–50% in patients with dementia[2]. Depression in dementia patients was also found to be associated with a higher level of caregiver depression. There are many studies that have also indicated the association between the global level of depression in dementia and in caregivers[3,4]. Moreover, 43.8% of the dementia caregivers in Taiwan are reported to be at risk of depression, which is higher than the prevalence of depression in the general population[4]. It is valuable to further explore potential variations and group the depressive symptoms in patients with dementia, and to investigate the association between different symptom clusters and caregiver depression in Taiwan.

The 30-item Geriatric Depression Scale (GDS-30) has been one of the most commonly used depression screening tools administered in geriatric populations. It has been shown to be reliable and sensitive, even in the patients with mild to moderate cognitive impairment[5]. The factor structure of GDS has been described from 2 to 9[6,7], with reports identifying factors possibly being dysphoria, worry, social withdrawal, apathy, decreased concentration, anxiety, agitation, positive mood, cognitive impairment, and lack of energy[8].

The aim of this study was to investigate the factor structures of the GDS-30 when assessing the depression in patients with dementia and to examine the relationship between different symptoms group of the GDS and the caregiver depression.

2. Materials and methods

2.1. Participants

The study contained 240 pairs patients with dementia and their caregivers who visited the memory clinic of a medical center in

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Taiwan from July 2001 to October 2008. Individuals who fit the diagnostic criteria for dementia from the 4th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)[9] were recruited and assessed for their stage of dementia using the clinical dementia rating scale (CDR)[10]. If the CDR reached 0.5, we further confirmed the clinical history, educational level as well as Mini-Mental State Examination (MMSE)[11,12] scores to validate the diagnosis of dementia. We used the self-rated GDS to survey the depressive symptoms in people with dementia. Therefore, to reduce heterogeneity of the sample, we included 240 patients with very mild (CDR = 0.5) to moderate dementia (CDR = 2) and excluded patients with a CDR level equal to or higher than 3 in this study. This research was approved by the institutional review board of the Changhua Christian Hospital.

The inclusion criteria for caregivers were (1) that they were a relative (older than 18 years) who was caring for the individual for at least 4 hours per day; (2) they were the primary caregiver and had intimate information about the patient over time; and (3) they agreed to be interviewed. The GDS, cognitive function, BPSDs, and basic and instrumental activities of daily living (ADL and IADL, respectively) of all patients were assessed by well-trained and qualified psychologists. The hospital has a standardized objective, evidence-based procedure to authorize psychologists to provide clinical services consistent with their qualifications. The trained researchers verbally administered the instruments to the subjects and recorded the answers according to standardized procedure of each measurement. Caregivers' backgrounds and an evaluation of their depression were collected at a single visit to the memory clinic.

2.2. Assessment of patients with dementia

The depression of dementia patients was evaluated using the Chinese version of the GDS-30. This scale was designed for the aged and although it was originally created for English-language studies[13], a Chinese-translated version was developed with good reliability and validity[14]. The GDS is a self-report scale consisting of 30 items answered using a yes/no response format. Values on the scale range from 0 to 30, with higher values indicating more symptoms of depression. In healthy elderly, a GDS-30 cut-off of 11 was found to result in a sensitivity of 84% whereas sensitivity decreased to 80% when a cut-off of 14 was applied[15]. We also evaluated patients' CDR[10] and calculated the Clinical Dementia Rating Scale Sum of Boxes (CDR-SOB) score, which is calculated by summing each of the domain box scores, with scores ranging from 0 to 18. The MMSE score of the patients was also collected.

2.3. Assessment of caregivers

In addition to demographics, we surveyed caregiver depression using the Center for Epidemiologic Studies Depression Scale (CES-D)[16], which is a 20-item self-reported index of depressive symptoms. It is a reliable and validated scale for screening depression symptoms. In a Taiwanese study, with a cut-off point of 16 in the community sample, the sensitivity and specificity were 92.0% and 91.0%, respectively[17].

2.4. Data analyses

Means and standard deviations (SD) were calculated for descriptive analysis of the participants' demographic data. We analyzed the factor structure of the GDS using the factor analysis method in SPSS 17.0. In this study, we performed an exploratory factor analysis (EFA) of the GDS. EFA was chosen due to its ability to identify the unique variance accounted for by latent variables or constructs. EFA using principal component factor analysis (PCF) with orthogonal varimax rotation was conducted on the 30 items of the GDS. Items with a factor loading of 0.3 or greater were considered to contribute to the factor. If there were items with multiple loadings of 0.3 or greater, the factor with the greatest loading score was considered to be contributed to by the items. Cronbach's alpha was calculated for both the GDS as a whole and for each composite factor. We used the Kaiser-Meyer-Olkin (KMO) statistic to examine the sampling adequacy[18], and Bartlett's test of sphericity to determine the necessity of a factor analysis. We found that the KMO value of the data was at 0.905, which is considered excellent, and the result of Bartlett's test was significant ($\chi^2 = 2510.12$, $df = 435$, $p < 0.001$). The assumption of a normal distribution of the sample was disproven using the Kolmogorov−Smirnov test, which showed violation. Therefore, we used a non-parametric test, Spearman's rank correlation coefficient, to evaluate the relationship between each factor (factor score) and caregiver depression (CES-D total score), and further performed partial correlation that controlled the CDR of the patients. We determined the factors associated with caregiver depression by using multiple linear regression analyses with the enter method. For all analyses, the probability level considered to indicate statistical significance was set at $p < 0.05$.

3. Results

Table 1 shows the demographic data of the patients in this study. With a GDS-30 cut-off point of 11, 47.9% of the subjects (115 of 240) revealed depression. Of the 240 caregivers, the mean age was 54.48 ± 14.12 years, and 51.7% were female; the educational level was 9.74 ± 4.58 years, and the mean CES-D score was 15.37 ± 9.87.

Table 2 presents the description of each item and the factor loadings of the GDS-30 for dementia patients. The factor analysis yielded seven factors in the GDS accounting for 59.31% of the variability. The Cronbach's alpha was 0.93 for the total scale. Factor 1 (dysphoria) mainly includes depressive symptoms; factor 2 (positive mood) represents the patients' sense of excitement and satisfaction with life; factor 3 (apathy) includes items that evaluate the patient's difficulty in initiating and making decisions; factor 4 (hopelessness) indicates feelings of helplessness and hopelessness; factor 5 (social withdrawal) suggests a preference to stay at home; factor 6 (decreased concentration) includes items that examine the patient's single-mindedness and energy levels; and factor 7 (cognitive impairment) consists of memory problems.

As can be seen in Table 3, we found factors 2, 3, 5, 6, 7 to have a statistically significant weak correlation with CESD total scores

Table 1
Demographic characteristics of the patients, n, mean ± SD.

	Lower GDS score[a] (N = 125)	Higher GDS score[b] (N = 115)	t/χ^2	p
Gender (women, %)	90 (72.0%)	72 (62.6%)	.605	.473
Age (years)	79.56 ± 7.26	79.26 ± 6.96	.303	.762
Educations (years)	4.52 ± 4.30	3.52 ± 4.48	1.656	.099
Diagnosis (AD, %)	78 (62.4%)	69 (60.0%)	1.868	.393
MMSE	15.68 ± 5.16	14.92 ± 5.88	.980	.328
CDR-SOB	6.59 ± 3.75	6.74 ± 3.42	−.293	.770
CES-D	13.08 ± 8.27	17.17 ± 10.98	−3.000	.003

The probability level considered to indicate statistical significance was set at $p < 0.05$.
Abbreviations: GDS = Geriatric Depression Scale; AD = dementia of Alzheimer's type; MMSE = Mini-Mental State Examination; CDR-SOB = Clinical Dementia Rating Scale Sum of Boxes; CESD = Center for Epidemiologic Studies Depression Scale.
 [a] Total GDS score was lower than 11.
 [b] Total GDS score was equal or higher than 11.