

Construct Validity of the 15-Item Geriatric Depression Scale in Older Medical Inpatients

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ABSTRACT

The construct validity of the 15-item Geriatric Depression Scale (sfGDS) has been assessed in selected populations. The aim of this study was to assess the appropriateness of applying the sfGDS to unselected older inpatients. The main component analysis of sfGDS was performed in 2032 medical inpatients (mean age = 76.3 ± 8.4). sfGDS did not qualify as a unidimensional test. Three factors explained 47.7% of variance and explored the following dimensions: positive attitude toward life, distressing thoughts/negative judgment about the own condition, and inactivity/reduced self-esteem. The internal homogeneity was poor (Cronbach's $\alpha = .46$). A higher fraction of variance was explained in patients independent in all or dependent in ≥ 1 activity of daily living (ADL). In older medical inpatients, sfGDS is not a single construct, which prevents the univocal interpretation of the final score. The higher fraction of explained variance in patients with comparable ADL performance probably reflects the dependency of affective from physical status. (*J Geriatr Psychiatr Neurol* 2003; 16:23–28)

Keywords: screening of depression; elderly; medical inpatients; short form GDS

The short form of the Geriatric Depression Scale (sfGDS) is currently used for clinical and research purposes.¹ Its appropriateness as a screening tool for home-dwelling elderly people has been questioned by Alden et al.² Burke et al³ reported that the sfGDS is an effective screening instrument in cognitively intact but not in mildly demented patients. The sfGDS was very effective in identifying depressed subjects in the Greek but not in the Israeli elderly population.^{4,5} The only study that validated the sfGDS among inpatients was performed in a selected population that included depressed, demented, and thought-disordered

people and not in the broad hospitalized geriatric population, which is more commonly screened for depression.⁶

The present study aimed at verifying whether the final score of sfGDS can be considered really representative of the outcome depression and to what extent impairment of selected psychological dimensions can be recognized by analyzing the performance of older medical inpatients.

METHOD

The present study uses data from a large collaborative observational study group, the Italian Group of Pharmacoepidemiology in the Elderly (Gruppo Italiano di Farmacoepidemiologia nell'Anziano [GIFA]). The GIFA is a multicenter study involving wards of geriatrics and internal medicine in community or university hospitals scattered over the whole Italian territory. The main objective of the GIFA study is to survey drug consumption, incidence and type of adverse drug reactions, and quality of hospital care. For the present study, we used data collected by 24 centers in the last survey performed (May-June and September-October 1998) because the sfGDS was not used in previous surveys.

Procedures were approved by the Catholic University Ethical Committee as well as by the Steering Committee of CNR-Aging Project. A detailed description of proce-

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dures is available elsewhere.^{7,8} Briefly, patients underwent a multidimensional assessment covering several domains: sociodemographic characteristics, smoking and alcohol intake history, medical problems, pharmacological therapy and adverse drug reactions, complete blood count, cognitive and affective status, and functional capabilities. Each domain was assessed according to a standardized and validated method, for example, functional capabilities by activities of daily living (ADL) and instrumental activities of daily living (IADL) scales, comorbidity by the Charlson's index, and cognitive status by the Abbreviated Mental Test (AMT).⁹⁻¹¹ Diseases and drugs were codified by the *International Classification of Diseases*, 9th revision (ICD-9), and the Anatomical and Therapeutical Classification, respectively.^{8,12} A detailed description of the GIFA protocol is available elsewhere.^{7,8}

Affective status was assessed using the sfGDS. Five items explore a positive attitude toward life (happy most of the time, satisfied with life, wonderful to be alive, full of energy, in good spirit) and thus can be defined as positive items. The 10 negative items generically assess dissatisfaction with life (life is empty, feel pretty worthless, feel helpless, often get bored, worry about the future, situation is hopeless, others are better off) or point at selected personal problems (problems with memory, prefer to stay home, dropped activities/interests). Every item contributes 1 point to the final score, which ranges from 0 to 15. A score greater than 5 is commonly considered as indicative of a depressive trait.¹

The present analysis refers to patients older than 60 years of age consecutively admitted to the participating centers. By protocol, a study physician administered the sfGDS on the day before the planned discharge because a great proportion of patients were too seriously ill to be interviewed on admission. Patients who died during hospital stay (n = 138) were excluded from the study. A total of 363 patients were excluded because of 1 or more of the following reasons: aphasia, illiteracy, deafness, unconsciousness, unwillingness to cooperate, or severe dementia. Due to these exclusion criteria, the analysis was conducted on 2032 patients.

Statistical Analysis

Statistical analyses were performed using SPSS software. Two complementary methods, the Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's test of sphericity, were used to evaluate the appropriateness of factor analysis.¹³ The aim of this preliminary phase was to evaluate whether items are reciprocally related so that a factor model can be developed. Weakly correlated variables cannot share common factors, thus making factor analysis inappropriate. Factors were extracted by the principal component analysis. From the basic component matrix, a rotated component matrix was obtained through a varimax with Kaiser normalization. The rotation phase allows the identification of factors summarizing sets of

closely related variables and then being more meaningful and easily interpretable than those obtained in the extraction phase. The varimax method pursues this objective by minimizing the number of items having loadings on a factor. The strength of the relationship of items to individual factors is directly proportional to the magnitude of the corresponding correlation coefficient in the rotated factor matrix. This allows the identification of items having loadings on a given factor. The optimal number of factors to be selected in the final model was chosen by the scree pattern method.¹⁴

The Cronbach's α was measured to assess the degree of internal homogeneity of the sfGDS.¹³ Factor analysis was repeated on patients matched for cognitive performance (AMT score less than 7, n = 435) or physical impairment (dependency in at least 1 ADL, n = 780). Sensitivity, specificity, and diagnostic accuracy of the sfGDS versus a diagnosis of major depression made according to the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., revised) criteria (n = 128) were computed.¹⁵

RESULTS

Table 1 shows the general characteristics of patients. Most of them had been admitted to wards of geriatrics. Their mean age was 76 years, and 37.2% were aged 80 or older. The overall educational level was low: only 21.6% had an 8-year formal education or more. Cerebrovascular, cardiovascular, respiratory, and metabolic diseases were the most common diagnoses. Dependency, as reflected by need of assistance in at least 1 ADL, affected 32.1% of patients. Impairment in 1 or more IADL was recorded in 69.7% of patients. Twenty percent of patients scored greater than 7 on the AMT; this figure rose to 28.9% in patients older than 80 years.

Table 2 shows results from the main component analysis on the whole population. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.865; this value is consistent with the correlations between individual pairs of variables being explained by the other variables. The value of the Bartlett's test of sphericity excludes that the correlation matrix for the 14 items is an identity matrix. Results from these 2 tests show that the main component analysis is appropriate to data. A 3-factor model was developed and could explain 47.7% of variance in GDS performance. The ratio between variances explained by the first and the second factor was 2.59, far from the cutoff of 3.5, which is considered to characterize a scale as unidimensional.¹⁶ Factor 1 had large loadings on 4 out of the 5 positive items, factor 2 on 5 negative items, and factor 3 on 1 positive and 4 negative items. Distressing thoughts and negative judgment about the own condition were the main areas related to factor 2, whereas inactivity and reduced self-esteem were related to factor 3. The item "worry about the future" remained unrelated to any factor.

Table 1. General Characteristics of the Patients

	<i>n</i>	%	<i>M</i> ± <i>SE</i>
Demographics and functional status			
Age			76.3 ± 0.18
Gender (female)	976	48	
Education (years)			5.26 ± 0.09
Living alone	348	17.3	
Abbreviated Mental Test			8.07 ± 0.04
Geriatric Depression Scale–short form			5.43 ± 0.08
Length of stay (days)			16.9 ± 3.7
Activities of daily living (impaired in 1 or more)	780	38.3	
Instrumental activities of daily living (impaired in 1 or more)	1485	73.1	
Comorbid conditions			
Charlson's index			1.8 ± 0.04
Chronic obstructive pulmonary disease	350	17.2	
Cerebrovascular disease	351	17.3	
Coronary artery disease	595	29.3	
Congestive heart failure	568	28	
Dementia	86	4.2	
Depression	113	5.6	
Diabetes	419	20.6	
Hypertension	862	42.4	
Acute myocardial infarction	142	7	
Renal disease	162	8	
Cancer	163	8	
Stroke	130	6.4	
Medication			
Antidepressant agents	191	9.4	
Digoxin	486	23.9	
Angiotensin-converting enzyme inhibitors	199	9.8	
Diuretics	499	24.6	
Calcium channel blockers	364	17.9	
β-blockers	54	2.7	
Corticosteroids	202	9.9	
Admission ward			
Geriatrics	1549	76.2	
Internal medicine	483	23.8	

Comparable results were obtained in the 2 strata with AMT < 7 or AMT > 6. The cumulative variance explained in these samples was 47% and 47.4%, and the best model was a 3-factor one with loadings of individual items fairly comparable to those observed in the general model.

In subjects dependent in at least 1 ADL, a more complex model was developed and is summarized in Table 3. It includes 5 main components explaining 28.9%, 11.7%, 7.9%, 7.3%, and 6.7% of the variance, respectively. Thus, the cumulative variance explained was 62.5%, but the relationship between factors and items was quite complex: while positive and most negative items had loadings with factors 1 and 2, respectively, factor 3 was related to loss of usual activity (prefer to stay home, dropped activities/interests); factors 3 and 4 were weakly related to items assessing self-esteem or memory and overall conditions in comparison with those of the general population.

Table 4 shows the model for subjects independent in all ADLs. It included four factors and could explain 53.6% of the variance. The ratio of variance explained by the first factor to that explained by the second factor was 2.6. The loadings of factors on the items did not reflect an easily interpretable pattern of psychological dimensions.

Table 2. Construct Validity of the Geriatric Depression Scale–Short Form in Older Medical Inpatients

	<i>Component</i>		
	1	2	3
Are you basically satisfied with your life?	0.686	-0.286	-0.11
Have you dropped many of your activities and interests?	-0.223	0.069	0.61
Do you feel that your life is empty?	-0.434	0.578	0.13
Do you often get bored?	-0.355	0.489	0.239
Are you in good spirits most of the time?	0.729	-0.147	-0.138
Are you afraid that something bad is going to happen to you?	-0.014	0.358	0.341
Do you feel happy most of the time?	0.775	-0.087	-0.199
Do you often feel helpless?	-0.25	0.724	0.113
Do you prefer to stay at home rather than going out and doing new things?	-0.02	0.197	0.58
Do you feel you have more problems with memory than most?	0.153	0.509	0.199
Do you think it is wonderful to be alive now?	0.731	-0.016	-0.051
Do you feel pretty worthless the way you are now?	-0.266	0.282	0.417
Do you feel full of energy?	0.443	0.309	-0.589
Do you feel that your situation is hopeless?	-0.222	0.72	0.054
Do you think that most people are better off than you are?	0.087	0.365	0.499
Variance explained by individual components (%)	28.903	11.154	7.681
Total variance explained (cumulative variance, %)	47.738		

Loadings of identified components on individual items and explained variance are reported.

The Cronbach's α for the general model was .46, which indicates a low level of homogeneity among items of the sfGDS. Values for partial models ranged between .40 and .48. Sensitivity and specificity of sfGDS > 5 versus a first-listed or secondary diagnosis of major depression were 78.9% and 61.7%, respectively.

DISCUSSION

Our findings show that in broad hospitalized geriatric populations, the sfGDS explores 3 different psychological areas, has good sensitivity but suboptimal specificity versus a diagnosis of depression, can explain less than 50% of total variance, and lacks unidimensionality. The latter 2 findings limit the interpretation of the sfGDS because the final score may reflect in variable proportions factors unrelated to the state of mood. After stratification by presence of physical impairment, the sfGDS could explain a larger proportion of variance, probably because of the strong relationship between physical and affective status in the elderly.¹⁷ Indeed, physical disability was found to predict the onset of depression in subjects older than 64 years of age.¹⁸

None of the previous studies assessed the construct validity of sfGDS on an unselected hospitalized geriatric population. Furthermore, the size of previously studied

Table 3. Construct Validity of the Geriatric Depression Scale–Short Form in Older Medical Inpatients Independent in All Activities of Daily Living

	Component			
	1	2	3	4
Are you basically satisfied with your life?	0.648	-0.325	-0.097	-0.036
Have you dropped many of your activities and interests?	-0.17	-0.075	0.634	0.187
Do you feel that your life is empty?	-0.315	0.574	0.337	-0.026
Do you often get bored?	-0.287	0.421	0.447	0.035
Are you in good spirits most of the time?	0.725	-0.146	-0.144	-0.105
Are you afraid that something bad is going to happen to you?	0.094	0.237	0.608	-0.059
Do you feel happy most of the time?	0.781	-0.094	-0.203	-0.102
Do you often feel helpless?	-0.144	0.71	0.174	0.178
Do you prefer to stay at home rather than going out and doing new things?	-0.157	0.054	-0.001	0.775
Do you feel you have more problems with memory than most?	0.03	0.413	-0.033	0.475
Do you think it is wonderful to be alive now?	0.758	-0.063	0.02	0.057
Do you feel pretty worthless the way you are now?	-0.18	0.259	0.582	-0.047
Do you feel full of energy?	0.426	0.391	-0.488	-0.198
Do you feel that your situation is hopeless?	-0.167	0.692	0.05	0.196
Do you think that most people are better off than you are?	0.022	0.124	0.288	0.627
Variance explained by individual components (%)	27.325	10.758	8.215	6.939
Total variance explained (Cumulative variance, %)	53.236			

Loadings of identified components on individual items and explained variance are reported.

Table 4. Construct Validity of the Geriatric Depression Scale–Short Form in Older Medical Inpatients Dependent in at Least One Activity of Daily Living

	Component			
	1	2	3	4
Are you basically satisfied with your life?	0.745	-0.046	-0.129	-0.021
Have you dropped many of your activities and interests?	-0.209	0.098	0.031	0.666
Do you feel that your life is empty?	-0.538	0.257	0.457	0.172
Do you often get bored?	-0.411	0.261	0.417	0.248
Are you in good spirits most of the time?	0.76	-0.047	-0.031	-0.128
Are you afraid that something bad is going to happen to you?	-0.016	0.661	0.013	-0.028
Do you feel happy most of the time?	0.768	-0.108	0.123	-0.156
Do you often feel helpless?	-0.363	0.577	0.369	0.03
Do you prefer to stay at home rather than going out and doing new things?	-0.047	0.067	0.172	0.781
Do you feel you have more problems with memory than most?	0.117	0.099	0.603	0.243
Do you think it is wonderful to be alive now?	0.69	-0.088	0.206	-0.053
Do you feel pretty worthless the way you are now?	-0.183	0.629	-0.239	0.204
Do you feel full of energy?	0.389	-0.134	0.54	-0.406
Do you feel that your situation is hopeless?	-0.304	0.575	0.419	-0.057
Do you think that most people are better off than you are?	0.063	0.535	0.177	0.198
Variance explained by individual components (%)	27.890	12.077	7.654	6.740
Total variance explained (cumulative variance, %)	54.361			

Loadings of identified components on individual items and explained variance are reported.

samples ranged between 72 and 285 subjects.¹⁻⁶ The present findings add to the knowledge on sfGDS by presenting results generalizable to the older medical inpatients. The main limit of sfGDS lies in its doubtful meaning: its internal structure does not guarantee that the final score of sfGDS measures what it is assumed to measure, that is, the state of mood. Examples of construct validity for the Mini-Mental State Examination (MMSE), the test most commonly used for screening dementia, help to clarify this issue: explaining a cumulative variance of 68% and being unidimensional, MMSE really expresses what it measures in community-dwelling older adults.¹⁹ The 56.1% explained variance and the clustering of individual items into well-defined dimensions of neurocognitive ability indicate that MMSE can effectively screen for cognitive impairment in older nursing home residents, but the final score should be interpreted with some caution because of the lack of unidimensionality.²⁰

The complex psychological status of older patients experiencing both an acute illness and the hospital stay

likely limits the possibility of a reliable screening of depression.²¹ Although we studied our patients immediately before discharge, it is unlikely that this limitation was completely overcome. We ignore whether the same limitation affects the other scales commonly used for screening depression in older medical inpatients because their construct validity has been assessed in samples that are small and/or poorly representative of this broad population.²²⁻²⁶

Even if its overall reliability was poor, the sfGDS had good sensitivity versus a diagnosis of depression and a logical structure of relationships between individual items and factors. The latter finding suggests that sfGDS can explore selected dimensions of mood such as self-esteem, distressing thoughts, positive attitude toward life, and judgment about own condition. Thus, an analytical interpretation of sfGDS performance might provide potentially important information. It is likely that impairment of some of the explored psychological dimensions has specific practical implications. The demonstration of a well-defined relationship between memory complaint and incident demen-

tia in the general geriatric population and between suicidal ideas and nonsuicidal death in medical older inpatients are examples of such a possibility.^{27,28}

Multidimensional assessment is the cornerstone of the current approach to the elderly patient.²⁹ Assessing social, medical, neuropsychological, and functional status allows for complete information on the health status of the patient and the planning of interventions aimed at improving that status or preventing further worsening. Multidimensional assessment is based on diagnostic instruments that should require little time and be easy to use, reproducible, sensible to small changes, and related to major outcomes such as disability and mortality. Several instruments exploring functional and mental status meet these requirements, while the same is not true of tests screening older medical inpatients for depression. The prominent role and the poor specificity of somatic symptoms in geriatric depression could partly explain this finding.³⁰ Furthermore, visual problems, illiteracy, and, mainly, lack of motivation frequently prevent older medical patients from completing the self-rated depression scale.³¹ Theoretically, lack of motivation could also affect the quality of self-rating. The important association between depression and cognitive impairment in older inpatients might further affect the quality of self-rating.³² Accordingly, the observed limitations of sfGDS might be common to other instruments based on self-rating. A comparison between self-rated and observer-rated depressive status in older medical patients could help clarify this issue.

In conclusion, analysis of construct validity of sfGDS disclosed a well-defined and logical set of component factors but failed to demonstrate a structure that could guarantee reliability of results. It is likely that selecting out the 15 items from the parent GDS according to findings obtained from a home-dwelling older population resulted in the development of a scale only partially fitting the needs of older medical inpatients.¹ Thus, future efforts should be finalized to develop an instrument specifically designed for this very large population to assess both prevalence and implications of depression as well as its responsiveness to therapeutic interventions.

CLINICAL IMPLICATIONS

- SFGDS cannot be considered an optimal instrument for screening depression in unselected older medical inpatients.
- Cognitive performance, as assessed by the AMT, does not affect the internal structure of sfGDS.
- SFGDS performs better in patients matched for level of physical capabilities.

LIMITATIONS

- The lack of a symptom-rating instrument prevented us from distinguishing the effects of symptoms

per se from those of disability on the internal structure of sfGDS.

- The data are taken from Italian hospitals, and the conclusions cannot be generalized to other settings.
- Men outnumbered women in our population. SFGDS might have a different internal structure in the presence of a female to male ratio similar to that of the older general population.

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