Use of the GDS-15 as a Depression Screen in Older Adults with
Mild to Moderate Cognitive Impairment

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Abstract
Few studies have examined the performance of the 15-item Geriatric Depression Scale (GDS-15) among older adults with cognitive impairment. The GDS-15 was administered to 166 cognitively impaired and 144 cognitively normal older volunteers. We compared the two groups on total score, individual item endorsement, and three factor scores: General Depressive Affect, Withdrawal, and Life Satisfaction. We hypothesized that cognitively impaired subjects would have higher scores in areas of the GDS-15 where depressive and cognitive symptoms are potentially confounded, e.g. Withdrawal and memory loss. In two-group MANCOVA analysis on factor scores, controlling for age and gender, the impaired group was significantly more symptomatic; univariate contrasts showed this was due to elevated General Depressive Affect scores. Higher levels of missing data were problematic among the cognitively impaired respondents, but controlled tests on factor scores lend support to the ability of the GDS-15 to detect depressive symptoms in the cognitively impaired group.

Keywords: depression, dementia, Alzheimer’s disease, mild cognitive impairment (MCI), measurement
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The 30-item Geriatric Depression Scale (GDS; Brink, Yesavage, et al., 1982) was designed specifically for older adults; its developers chose a yes/no response format in order to minimize confusion and fatigue among older respondents (Yesavage, et al., 1983). An advantage of the GDS is that it can be self-administered or administered by lay interviewers (Debruyne, Van Buggenhout, LeBastard, et al, 2009). The 15-item Geriatric Depression Scale (GDS-15; Sheikh & Yesavage, 1986) was created later from the original items to reduce time and respondent burden in administering the measure. Both the GDS and GDS-15 have demonstrated adequate reliability and validity with various groups of older adults (de Craen, Gusseklooo, Teng, et al., 2003; D’Ath, Katona, Mullen, et al., 1994; Lyness, Noel, Cox, et al., 1997; Pomeroy, Clark & Philip, 2001; McGivney, Mulvihill & Taylor, 1994; Shah, Phongsathorn, Eielawska, et al., 1996). Despite its relative ease of administration, few studies have examined the performance of the GDS-15 among older adults with cognitive impairment.

Self-report measures for older adults, in contrast to clinician or proxy measures, present the challenge of knowing whether the respondent is able to understand the questions and provide a reasonably accurate answer. This becomes a concern when dealing with individuals with some degree of cognitive impairment. Burke and colleagues (1992) concluded that the 30-item GDS adequately detected depression in cognitively impaired older patients in a geriatric assessment clinic, but several other studies have raised concerns about deficit awareness (Feher, Larabee & Crook, 1992; Snow, Kunik, Molinari et al, 2005) or item comprehension (Cannon and colleagues; 2002) among cognitively impaired respondents. Other investigators suggested
limiting the full GDS to patients with higher mental status or to those with MCI, but not AD (Bedard, Molloy, Squire et al, 2003; Debruyne et al, 2009). Missing data was a problem for cognitively impaired nursing home residents on the shorter GDS-15 (Koehler, Rabinowitz, Hirdes, et al., 2005). Miller-Thomsen and colleagues (2005) found the GDS-15 had poorer internal consistency reliability in a moderate to severe AD group, compared to a mild AD group.

Just one study (Mast, 2005) examined GDS symptom cluster scores for cognitive impaired respondents, reporting that social withdrawal and psychomotor agitation were more highly endorsed but did not differentiate depression from non-depression among the cognitively impaired group. Multidimensionality of the GDS-15 was posited in a study that identified three factors encompassing fourteen out of the fifteen items (Mitchell, Mathews & Yesavage, 1993). Factors reported were General Depressive Affect, seven items describing dysphoria and mood symptoms; Life Satisfaction, four items stated in positive terms; and Withdrawal, three items that correspond to the longer Withdrawal, Apathy, lack of Vigor (WAV) factor identified in the full GDS (Adams, 2001; Adams, Matto & Sanders, 2004).

Factors of the GDS-15 serve as a potential starting place for examining differential endorsement rates of symptom clusters among people with cognitive impairment when compared to cognitively intact elders. Apathy is a known symptom of dementia such as AD (Lyketsos & Olin, 2002; Landes, Sperry, Strauss & Geldmacher, 2001) and there is a potential confound in items that relate to cognitive symptoms, such as memory or decision-making, when screening for depression in older adults with cognitive impairment. Because apathy and memory loss are hallmarks of dementia as well as possible signs of depression included on the scale, we hypothesized that cognitively impaired subjects would have higher scores in areas of the GDS-15 where depressive and cognitive symptoms are potentially confounded, e.g., the three-item
 Withdrawal factor and the single item about memory loss, which would suggest that the measure was not functioning in the same way across groups. This pilot study compared subscale scores on the GDS-15 from two groups of older adults—one diagnosed with mild cognitive impairment (MCI) Alzheimer’s disease (AD), or another dementia, and the other cognitively normal—to determine any differential subscale functioning.

Method

Participants

The GDS-15 was administered to 166 older adults with cognitive impairment and 144 cognitively normal older volunteers, all presenting for first visits at the Case Western Reserve University/University Hospitals of Cleveland Memory and Aging Center Alzheimer’s Disease Research Center (ADRC) during 2003-2006. The cognitively impaired group came to the ADRC for a research evaluation of possible dementia. The cognitively normal group consisted of community volunteers recruited through community outreach and ongoing publicity about research participation opportunities at the Center. These volunteers were offered the same type of evaluation as dementia patients. All participants were administered the GDS-15 orally by a trained interviewer. The protocol for this administration added an additional response category, “I don’t know,” for use if the respondent would not or could not answer “yes” or “no.”

Each individual, whether from the impaired or normal group, was evaluated by a neurologist and neuropsychological testing and obtained a provisional diagnosis using CERAD criteria through consensus conference. In the cognitively impaired group, 43.3% were diagnosed with MCI or some cognitive impairment, 39.2% with possible or probable AD, 5.4% with vascular dementia, and 12% with other or uncertain type of dementia. Using the Clinical
Dementia Rating (CDR; Morris, 1993) over two-thirds of the respondents in the impaired sample were rated as mildly impaired, including those with MCI and many with dementia. Only 16 cases were rated as moderately impaired (9.6%) and eight cases were rated as severely impaired (4.8%). Adding validity to the distinction between the impaired and intact groups, the mean Mini-Mental Status Examination (MMSE; Folstein, Folstein & McHugh, 1979) score for the cognitively impaired group was in the cognitively impaired range for that group. The intact group had a mean MMSE score of 29.15, compared to the cognitive impaired group’s mean MMSE score of 23.13 (t = 11.29, p < .001.)

Results

We examined group differences to determine whether the cognitively impaired and intact groups differed in age and gender distribution. The impaired group was older (mean age 73.94 vs. 67.14 years; t = 6.52, p < .001) and was disproportionately male ($\chi^2 = 9.994$, p = .002) compared with the cognitively normal group.

The cognitively impaired group was found to have more missing or “don’t know” responses on the GDS-15 than the cognitively normal group. Approximately 33% of the impaired group had one or more missing items on the GDS-15, while 18% of the cognitively normal group had one or more missing items ($\chi^2 = 13.95$, p = .007). Missing responses were not equally distributed among the items, and thus not completely at random. Two items, “more memory problems than most” and “wonderful to be alive now” were missed by the most respondents of both groups. The “memory” item was missed by 10 intact respondents and 16 impaired respondents; the “wonderful” item was missed by four intact respondents and 10 impaired respondents. Additional items, “feeling hopeless,” “others better off,” “happy most of the time” and “life is empty” had fewer missing responses.
Items corresponding to the three factors identified by Mitchell and colleagues (1993), along with Cronbach’s alpha reliabilities, means and standard deviations for the factors by group are shown in Table 1. Alpha reliability coefficients were calculated without replacing any missing data. These coefficients range from a low of .420 for the General Depressive Affect subscales among the non-impaired group, to .640 for the Life Satisfaction subscale for the cognitively impaired group.

For summary score calculations, missing GDS data were replaced with the sample mean for that item. After replacing missing data, the cognitively impaired group had a mean GDS-15 score of 2.86 (+/-2.68) compared with 1.75 (+/-2.04) for the cognitively intact group (df = 308, t= - 4.132, p < .001). Using the cut-off of 5 points or greater to suggest at least mild depression (Shiekh & Yesavage, 1986), 31 participants (18.7%) from the cognitively impaired group and 12 participants (8.3%) from the intact group were depressed. The greatest differences in individual GDS-15 item endorsement, with greater endorsement in the depressed direction by the cognitively impaired group, were seen for the “memory problems” “others better off,” “feel worthless,” and “dropped activities” items.

To identify differences on the GDS-15 while controlling for group differences in age and gender, we conducted a two-group multivariate analysis of covariance (MANCOVA) on the set of the three factor scores, with cognitive status as the dichotomous independent variable. (Table 2.) In this analysis, the impaired group was significantly more symptomatic overall (Hotelling’s T = .040, F = 4.0, p = .008). The multivariate partial Eta squared shows the proportion of the variance in the set of GDS-15 subscales related to cognitive group status to be .038, a significant result. Because this multivariate F was significant, univariate contrasts were conducted for each subscale. In univariate tests (Table 3), cognitive status had a significant effect on General
Depressive Affect (F = 11.133, p = .001; partial Eta squared = .035), but not on Life Satisfaction or Withdrawal. Cognitive status accounted for 3.5% of the variance in General Depressive Affect. Age had a significant effect on the Withdrawal factor (F = 4.326, p = .038; not shown in table). Those who were older, regardless of cognitive status, scored higher on the set of three withdrawal items.

Discussion

Cognitively impaired and intact older adults differed on the General Depressive Affect subscale of the GDS-15, but not on Withdrawal or Life Satisfaction. This suggests that the cognitively impaired group’s GDS-15 scores were not disproportionately influenced by symptoms of cognitive impairment, e.g. apathy or social withdrawal, and the scale detected higher levels of affective or dysphoric symptoms of depression in these patients. Research suggests that depression in dementia is not usually reactive to awareness of the dementia per se (Lyketsos & Olin, 2002), thus is it not likely that the cognitively impaired respondents were endorsing higher levels of sadness or negative self-evaluation solely in reaction to their cognitive losses.

The GDS-15 “more problems with memory” item appears to be a problematic item in the assessment of elders with cognitive impairment, because it most clearly reflects cognitive loss rather than depression within this population. This item had the highest proportion of missing responses and also showed the greatest between groups difference in endorsement, but because it was omitted from subscale scores in the Mitchell et al. (1993) study, it was not part of the three subscales analyzed in our study. Taken individually, this item could be an indicator of awareness of cognitive symptoms, but our findings suggest it appropriately should be omitted when figuring total scores for people with cognitive impairment.
Several limitations to this study suggest further research is needed. First, although individuals with mild cognitive impairment (MCI) frequently have higher incidence of depression than cognitively intact elders (Chan, Kasper, Black & Rabins, 2003; Forsell, Palmer & Fratiglioni, 2003), we had insufficient numbers of MCI participants to enable analysis of their results separately from participants diagnosed with AD or other dementia. In addition, some of our Cronbach’s alpha coefficient levels were somewhat lower than recommended to demonstrate good internal consistency, suggesting that the measurement model from Mitchell and colleagues (1986) was not an optimal fit for these data. We note that this sample, particularly the cognitively intact group, was comprised of mostly non-depressed individuals; this may explain the lower internal consistency coefficients among the intact group. A larger sample with a higher proportion of depressed respondents would be better suited to compare the functioning of the proposed measurement model for the GDS-15 and to evaluate its differential functioning within cognitive groups.

A major strength of this study is that participants received clinical assessment and neuropsychological testing to establish their cognitive status. Our findings lend support to using the GDS-15 as a screen for depression in older adults with MCI or mild to moderate dementia, with the two following caveats: First, missing data may be problematic. Data collection procedures should be designed to prevent missing data whenever possible. Resulting missing data should be examined for patterns and excess. Second, the “memory problems” item may best be omitted from scores for older adults with diagnosed cognitive losses, to avoid counting as a depressive symptom.
References


### Table 1

**Geriatric Depression Scale-15 Subscale Items, Means, Standard Deviations, and Cronbach Alpha Coefficients by Cognitive Group**

<table>
<thead>
<tr>
<th>Cognitive Group</th>
<th>Mean (Std. Dev.)</th>
<th>Cronbach’s α</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cognitively Impaired Participants (N = 166)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generalized Depressive Affect (7 items)</td>
<td>.96 (1.32)</td>
<td>.625</td>
</tr>
<tr>
<td>Life Satisfaction (4 items)</td>
<td>.41 (.84)</td>
<td>.640</td>
</tr>
<tr>
<td>Withdrawal (3 items)</td>
<td>.97 (.96)</td>
<td>.441</td>
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<tr>
<td><strong>Cognitively Intact Participants (N = 144)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generalized Depressive Affect (7 items)</td>
<td>.53 (.86)</td>
<td>.420</td>
</tr>
<tr>
<td>Life Satisfaction (4 items)</td>
<td>.35 (.77)</td>
<td>.630</td>
</tr>
<tr>
<td>Withdrawal (3 items)</td>
<td>.72 (.93)</td>
<td>.584</td>
</tr>
</tbody>
</table>
Table 3 Two-Group MANCOVA for Set of GDS-15 Subscales: (N = 310)

<table>
<thead>
<tr>
<th>Multivariate Tests</th>
<th>Hotelling’s T</th>
<th>F</th>
<th>df</th>
<th>p value</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.003</td>
<td>.279</td>
<td>3</td>
<td>.840</td>
<td>.003</td>
</tr>
<tr>
<td>Sex</td>
<td>.001</td>
<td>.058</td>
<td>3</td>
<td>.982</td>
<td>.001</td>
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<tr>
<td>Age in years</td>
<td>.015</td>
<td>1.481</td>
<td>3</td>
<td>.220</td>
<td>.014</td>
</tr>
<tr>
<td>Cognitive Status Group</td>
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<td>4.004</td>
<td>3</td>
<td>.008</td>
<td>.038</td>
</tr>
</tbody>
</table>

\(^1\)Partial Eta squared value
Table 4

Univariate Tests on GDS-15 Subscales for Cognitive Status Group, Adjusted for Sex and Age (N = 310)

<table>
<thead>
<tr>
<th>Subscales</th>
<th>Mean Square</th>
<th>F</th>
<th>df</th>
<th>p value</th>
<th>size&lt;sup&gt;1&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Satisfaction</td>
<td>.201</td>
<td>.300</td>
<td>1</td>
<td>.584</td>
<td>.001</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>2.036</td>
<td>2.345</td>
<td>1</td>
<td>.127</td>
<td>.008</td>
</tr>
<tr>
<td>Gen. Depress. Affect</td>
<td>16.300</td>
<td>11.133</td>
<td>1</td>
<td>.001</td>
<td>.035</td>
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</tbody>
</table>

<sup>1</sup>Partial Eta squared value