

Dependency aspect of caregiver burden is uniquely related to cognitive impairment in Veterans

Jennifer M. Stinson, PhD;¹ Robert L. Collins, PhD;^{2*} Kacey Little Maestas, PhD;³ Vitor Pacheco, MD;² Ashley LeMaire, PhD;⁴ Jared Benge, PhD⁵

¹Mental Health Care Line, Michael E. DeBakey Department of Veterans Affairs Medical Center (MEDVAMC), Houston, TX; and Department of Educational Psychology, University of Houston, Houston, TX; ²Neurology Care Line, MEDVAMC, Houston, TX; and Department of Neurology, Baylor College of Medicine, Houston, TX; ³Physical Medicine and Rehabilitation, Baylor College of Medicine, Houston, TX; and Brain Injury Research Center, TIRR Memorial Hermann, Houston, TX; ⁴Department of Neuropsychology, TIRR Memorial Hermann, Houston, TX; ⁵Department of Neuropsychology, Scott & White Neuroscience Institute and Plummer Movement Disorders Center, Temple, TX

Abstract—The psychosocial toll of caring for an individual with dementia is an important, if understudied, concept. For practitioners and researchers alike, understanding the relation between patient characteristics and different facets of caregiver burden is important for guiding treatment and prevention efforts. The current study analyzed the dimensions of caregiver burden and the relation between caregiver burden and results of neuropsychological testing. Participants included 243 dyads of caregivers and Veterans referred for neuropsychological evaluation. Caregivers completed the Zarit Burden Interview (ZBI) to assess caregiver burden. Patients completed a battery of neuropsychological tests measuring the domains of attention/processing speed, memory, language, and executive functioning. A principal components analysis of the ZBI revealed a three-factor structure: psychosocial burden, dependency burden, and guilt. Correlations with neuropsychological test performance by Veteran patients suggested that test performance in the memory, attention, processing speed, executive functioning, and emotional functioning domains were solely related to the caregiver dependency burden factor of the ZBI. Additional analyses suggested severity of dementia and number of tests in the impaired range further influenced reported caregiver burden. The current study is one of the few studies examining caregiver burden in relation to neuropsychological functioning in a mixed clinical sample and has important implications for clinical practice.

Key words: burden, caregiver, cognitive impairment, dementia, factor analysis, geriatric, neuropsychology, rehabilitation, Veterans, Zarit Burden Interview.

INTRODUCTION

Caregiver burden has traditionally been defined as the amount of distress (e.g., physical, psychological, social, and financial/socioeconomic problems) experienced by individuals who care for adults with chronic

Abbreviations: APA = American Psychological Association, BDI-II = Beck Depression Inventory-II, BNT = Boston Naming Test, CVLT-II = California Verbal Learning Test-II, DVT = Digit Vigilance Test, IADL = instrumental activity of daily life, MEDVAMC = Michael E. DeBakey Department of Veterans Affairs Medical Center, MMSE = Mini-Mental State Examination, SD = standard deviation, TMT = Trail Making Test, VA = Department of Veterans Affairs, WAIS-III = Wechsler Adult Intelligence Scale-III, ZBI = Zarit Burden Interview.

*Address all correspondence to Robert L. Collins, PhD; Neurology Care Line (127), Michael E. DeBakey VA Medical Center, 2002 Holcombe Blvd, Houston, TX 77030.

Email: Robert.Collins3@va.gov

<http://dx.doi.org/10.1682/JRRD.2013.11.0246>

debilitating diseases or conditions, such as dementia, cancer, or musculoskeletal diseases [1–2]. Across many different illnesses, the negative outcomes of high caregiver burden are well documented and include higher levels of depression and feelings of isolation, increased physical health problems, and increased risk for work disruption [2–4]. Research examining the causes of increased caregiver burden in dementia has yielded mixed findings. Some research has indicated that behavioral problems in impaired elderly adults contribute more to caregiver burden than cognitive impairment [4], while others suggest that cognitive decline and functional impairment (core features of dementia) explain more variance than behavioral features alone [1]. In contrast, other studies have shown that severity of dementia is not always related to caregiver distress [2,5].

Some of these discrepancies may be related to inherent heterogeneity within and between dementia patients. Far from a cohesive entity, dementia has many subtypes, often related to different features of cognitive, behavioral, and physical functioning and often expressed differently across a continuum of severity. For example, the behavioral and psychiatric morbidities associated with Alzheimer disease are not typically manifested early in the course, whereas the changes in movement associated with Parkinson disease or the confusion in dementia with Lewy bodies may occur early on and be significantly related to caregiver burden [6]. Lee et al. found that individuals with dementia with Lewy bodies and Parkinson disease dementia experienced more caregiver burden [7]. Similarly, in a sample of Alzheimer disease patients, psychotic symptoms and compromised instrumental activities of daily living (IADLs) were related to increased caregiver burden, while cognitive dysfunction was not [5].

The tenuous relation between dementia severity and care burden may also be related to the way in which dementia severity is measured or conceptualized. Across most studies considering the relation between cognitive impairment and caregiver burden, cognition is typically measured grossly with a screening instrument (e.g., Mini-Mental State Examination [MMSE]) or with shorter cognitive batteries in dementia populations with higher levels of cognitive impairment (e.g., Berger et al. [1], Germain et al. [2], and Yeager et al. [5]). While these types of instruments can provide useful information, they do not provide a comprehensive understanding of cognitive status and can be relatively insensitive to important variability in cognition in earlier stages of the disease

process. The MMSE, for instance, is widely used but is not particularly sensitive to change [1] and has been criticized for not detecting early dementia [8]. Using caregiver or professional observational reports to determine cognitive functioning is also problematic. In a longitudinal study using both caregiver observational reports and professional observational reports of cognitive decline, Berger et al. found large discrepancies between reports given by caregivers and reports given by professionals [1]. During their 2 yr study, Berger et al. found the caregiver report of memory was significantly correlated with the MMSE at baseline only, highlighting long-noted issues with low correlations between subjective reports of cognition and formal testing. The sum of these findings suggests that using a screening tool or caregiver/professional observational report may not adequately capture patient cognition.

While caregiver burden is generally thought of as a multidimensional construct [1,9–10], the most commonly used measure of caregiver burden, the Zarit Burden Interview (ZBI) [11], produces a single summary score [9–10]. The ZBI is a 22-item survey asking caregivers to respond to several aspects of caregiver burden. Because of its strong internal consistency, ease of administration, and high face validity, it is frequently used by clinicians and in caregiver research [3,10]. In the years since its development, researchers identified numerous latent factors of caregiver burden as measured by the ZBI (see Flynn Longmire and Knight [3] for a review). While some researchers have confirmed a single-factor structure [12–13], others have identified a two-factor [14] or three-factor [10–11] structure to be a better fit. In the studies examining the ZBI's factor structure, there is not a single interpretation that has risen above the rest [3]. Researchers identifying a two-factor structure have named the factors personal strain and role strain [14–15]. Knight et al. [10] identified embarrassment/anger (e.g., feeling strained), patient's dependency (e.g., relative is dependent), and self-criticism (e.g., should be doing more). To date, none of the studies examining the factor structure of the ZBI have sought to explore the relationship between the individual factors of caregiver burden and comprehensive neuropsychological testing. This is a theoretically important question, because understanding how particular patient factors relate to particular caregiver outcomes can help guide interventions and hone assessment procedures.

At this point, the relation between patient cognitive functioning and reported caregiver burden remains unclear and may be related to various factors, ranging from utilization of screeners as a proxy for cognition, disease severity, disease subtype, and/or the measurement of the burden construct itself. The primary goal of the current study was to examine the relation between facets of caregiver burden as well as patients' cognitive abilities in a mixed clinical sample of Veteran patients referred for neuropsychological assessment. The secondary goals were to evaluate the relation between dementia severity and the ZBI, as well as diagnosis and the ZBI. Finally, the caregiver literature has called for more research clarifying the dimensions of caregiver burden, specifically the ZBI [3,5]. As such, a final goal was to assess the factor structure of the ZBI in this sample of older Veterans.

METHODS

The institutional review boards of the Michael E. DeBakey Department of Veterans Affairs Medical Center (MEDVAMC) and Baylor College of Medicine approved this research, and we have fully complied with the American Psychological Association (APA) ethical standards throughout this research project. Participants included 243 dyads of caregivers and Veterans initially evaluated at a cognitive disorders clinic at the MEDVAMC and subsequently referred for neuropsychological evaluation. The mean age of the Veterans was 71.2 yr (standard deviation [SD] = 10.6), and 96.7 percent were male. Of the 243 Veterans, 18.9 percent were black, 69.1 percent were white, and the remaining 10.3 percent were of differing self-reported racial or ethnic group and were collapsed into a single category in order to facilitate analyses. The majority of caregivers identified themselves as the Veteran's spouse (75.0%), with 13.6 percent identifying themselves as a child of the Veteran, 6.1 percent as other family members, and 4.1 percent as a friend. Please see **Table 1** for complete demographic characteristics of Veterans and caregivers. Dementia diagnostic categories were retrospectively made by a board-certified neurologist who had access to neuropsychology findings, neuroimaging, and neurological findings. Please see **Table 2** for demographics regarding diagnostic categories.

Patients completed a battery of neuropsychological tests measuring the domains of attention/processing speed, memory, language, and executive functioning. A

Table 1.

Demographic characteristics of Veterans ($n = 243$).

Variable	%	Mean \pm SD
Veteran		
Sex (male)	96.7	—
Age (yr)	—	71.2 \pm 10.6
Race		
Black	18.9	—
White	69.1	—
All Other	11.9	—
Education (yr)	—	12.0 \pm 3.1
Caregiver		
Relationship to Veteran		
Spouse	75.0	—
Child	13.6	—
Other Family	6.1	—
Friend	4.1	—
Contact with Veteran (d/wk)		
≥ 5	92.2	—
< 5	7.8	—

SD = standard deviation.

Table 2.

Diagnostic category characteristics of Veterans ($n = 243$).

Diagnosis	n	%
Amnesic MCI	7	2.9
Vascular Dementia	52	21.4
Vascular + AD	33	13.6
AD	18	7.4
Nonamnesic MCI	23	9.5
Mood	10	4.1
No Dementia	26	10.7
LBD	12	4.9
Other	62	25.5
Total	243	100.0

AD = Alzheimer disease, LBD = dementia with Lewy bodies, MCI = mild cognitive impairment.

board-certified clinical neuropsychologist (R. L. C.), or a supervised neuropsychology trainee, administered all neuropsychological tests. All neuropsychological measures were used as part of a standard neuropsychological battery, as determined by the supervising clinical neuropsychologist for each patient, and were scored using appropriate normative data. Additionally, caregivers independently completed a measure of perceived burden and Veteran patients completed a self-report questionnaire measuring depressive symptoms.

Burden

Caregivers independently completed the ZBI [11] to assess caregiver burden (22 items).

Language

The language domain was measured by confrontation naming ability, as assessed by the Boston Naming Test (BNT) [16]. For this test, administrators display pictures to patients, one at a time, and ask them to name the item they see. The BNT has high correlations with performance on tests of verbal ability ($r = 0.65\text{--}0.83$).

Memory

Memory for unstructured verbal material was measured by the California Verbal Learning Test-II (CVLT-II) [17]. Patients are read a 16-word list and asked to recall words from the list over five learning trials. Patients are then asked to recall words from the list after presentation of a distractor list and again after a 20 min delay. Split-half reliability correlation coefficients range from 0.77 to 0.86. Test-retest reliability coefficients range from 0.76 (1 yr) to 0.82 (21 d).

Attention/Processing Speed

Attention/processing speed was assessed with the Trail Making Test (TMT) Part A [18] and Wechsler Adult Intelligence Scale-III (WAIS-III) [19] Coding and Digit Span subtests, the Stroop Word Reading and Color Naming trials [20], and the Digit Vigilance Test (DVT) [21]. The TMT is a two-part test. The first part (A) asks participants to connect (in sequential order) numbered dots that are originally displayed randomly. Practice effects make test-retest reliability difficult to assess; however, this test correlates well with other measures requiring high visual perceptual and speech, suggesting high construct validity [22]. The Coding subtest of the WAIS-III requires participants to correctly translate numbers into symbols by using a key. The Digit Span subtest requires participants to remember an increasingly long span of digits and recite them back in different orders (e.g., forward, backward). The Stroop Word Reading and Color Naming trials measure the speed at which a patient can read names of colors and perceive colors. Test-retest reliability for the word subtest is 0.86 for Word Reading and 0.82 for Color Naming [23]. The DVT requires participants to scan a page with randomly distributed numbers and cross out a single specified number. Test-retest reliability coefficients range from $r = 0.87$ to 0.89 [21]. The

DVT demonstrates convergent validity with other tests of processing speed (e.g., WAIS-III Digit-Symbol Modalities).

Executive Functioning

Executive functioning was assessed using TMT Part B [18], the Stroop Color-Word Reading [20], Semantic Fluency, and Phonemic Fluency (FAS). TMT Part B is the second part of the TMT described in the previous paragraph. This is a test of cognitive flexibility, because it requires patients to draw consecutive lines while alternating between numbers and letters. In comparison to Part A, tests of construct validity indicate Part B scores correlate stronger with tests that require task-switching rather than visual perception [22]. Color-Word Reading is the third component of the Stroop test, which is a measure of response inhibition requiring patients to inhibit a prepotent response. Test-retest reliability for Stroop Color-Word Reading is 0.73 [20]. Phonemic Fluency (FAS) requires patients to name words that begin with a selected letter while attempting to suppress responses that violate rules outlined by the examiner. Cronbach alpha coefficient among the three letters (F, A, and S) is high (0.83), as is test-retest reliability (0.72) [23].

Mood

Additionally, when appropriate, the Veterans completed a commonly used self-report depression questionnaire, the Beck Depression Inventory-II (BDI-II) [24].

RESULTS

Preliminary Analysis: Factor Analysis of Zarit Burden Interview

Prior to primary analyses, the 22 items of the ZBI were subjected to principal components analysis in order to determine the factors to be used in subsequent analyses. Oblique (promax) rotation was chosen, because previous factor analytic studies of the ZBI reported elevated intercorrelations among factors (e.g., Flynn Longmire and Knight [3] and Knight et al. [10]). The Kaiser-Meyer-Olkin [25] value was 0.93 and Bartlett's Test of Sphericity [26] was statistically significant ($p < 0.001$), indicating that the intercorrelation matrix was appropriate for factor analysis.

The Kaiser criterion (eigenvalues >1) suggested three factors, which accounted for 57.1 percent of the variance. Examination of the scree plot also supported a three-factor

solution. Item 17 (“Do you feel you have lost control of your life since your relative’s illness?”) showed strong loadings (>0.4) on factors 1 and 2 and was therefore removed from further analysis. All other items showed strong loadings (≥ 0.4 in absolute value) on only one factor. Following deletion of item 17, a three-factor solution remained with factors explaining 42.4, 8.6, and 5.9 percent of the variance, respectively.

As shown in **Table 3**, factor 1 was composed of 11 items that assess the social and emotional consequences of caregiving; this factor was labeled “psychosocial burden.” Factor 2 was composed of 7 items that reflect stress caregivers may experience as a consequence of the care recipients’ dependency on them; this factor was labeled “dependency burden.” Factor 3 was composed of 3 items that reflect feelings of guilt caregivers may experience; this factor was labeled “guilt.” There was a strong correlation between the psychosocial burden and dependency burden factors ($r = 0.69$). In contrast, the guilt factor

showed a relatively weak correlation with the psychosocial burden ($r = 0.28$) and dependency burden ($r = 0.26$) factors.

Primary Analysis: Relation Between Zarit Burden Interview Factors and Neuropsychological Measures

After controlling for age and education, correlations between the three factors and neuropsychological tests indicated scores on the dependency burden factor were significantly and solely correlated with performance on the CVLT-II Long Delay Free Recall ($r = -0.20$), TMT Part A ($r = 0.20$), WAIS-III Coding ($r = -0.15$), Stroop Word Reading ($r = -0.17$), Stroop Color Naming ($r = -0.17$), DVT time ($r = 0.21$), Stroop Color-Word Reading ($r = -0.20$), Semantic Fluency ($r = -0.15$), and scores on the BDI-II ($r = 0.30$). No significant correlations were found between neuropsychological test performance and the psychosocial burden or guilt factors (**Table 4**).

Table 3.

Factor structure and loadings for Zarit Burden Interview.

Item	Item Description	Factor 1	Factor 2	Factor 3
13	Feel uncomfortable about having friends over	0.80		
5	Feel angry	0.75		
4	Feel embarrassed	0.73		
18	Wish you could leave care to someone else	0.72		
6	Relative affects relationships with others in negative way	0.69		
19	Feel uncertain	0.64		
9	Feel strained	0.60		
22	Feel burdened	0.55		
11	Don't have privacy	0.51		
12	Social life has suffered	0.48		
16	Unable to take care of relative much longer	0.42		
8	Relative is dependent		0.89	
14	Only one relative depends on		0.83	
2	Not enough time for yourself due to time with relative		0.74	
3	Stressed trying to balance care and family/work responsibilities		0.67	
10	Health has suffered because of involvement with relative		0.66	
15	Not enough money to take care of relative		0.62	
1	Relative asks for more help than he/she needs		0.60	
21	Could do a better job in caring for relative			0.90
20	Should be doing more for your relative			0.84
7	Afraid what the future holds for your relative			0.51

Note: Factor 1 = psychosocial burden, factor 2 = dependency burden, factor 3 = guilt.

Table 4.

Partial correlations of Zarit Burden Interview factors and neuropsychological testing.

Neuropsychological Measure	Psychosocial Burden	Dependency Burden	Guilt
Language			
BNT	-0.13	-0.04	0.03
Memory			
CVLT-II Total 1-5	-0.05	-0.12	-0.10
CVLT-II Short-Delay	-0.01	-0.08	-0.04
CVLT-II Long-Delay	-0.10	-0.20*	-0.10
Attention & Processing Speed			
TMT-A	0.02	0.20 [†]	-0.01
WAIS-III Coding	0.02	-0.15*	-0.03
WAIS-III Digit Span	-0.07	-0.13	-0.01
Stroop Word Reading	-0.05	-0.17*	-0.04
Stroop Color Naming	-0.08	-0.17*	-0.02
DVT Time	0.04	0.21*	0.10
Executive Functioning			
TMT-B	0.01	0.10	0.12
Stroop C-W Reading	-0.10	-0.20*	-0.10
Phonemic Fluency (FAS)	-0.02	-0.13	-0.05
Semantic Fluency	0.10	-0.15*	-0.13
Emotional Functioning			
BDI-II	0.15	0.30 [†]	0.19

Note: $n = 243$.

* $p < 0.05$.

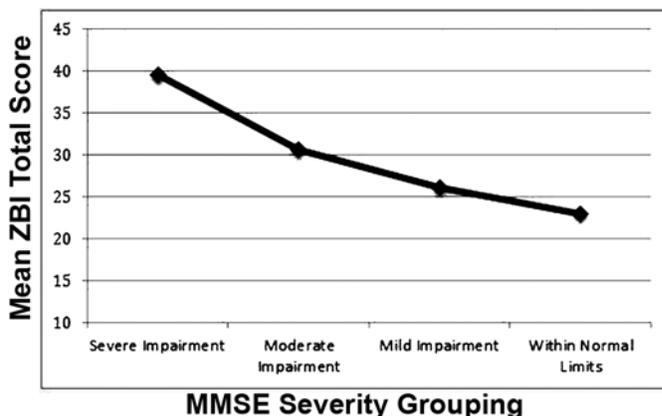
[†] $p < 0.01$.

BDI-II = Beck Depression Inventory-II, BNT = Boston Naming Test, CVLT-II = California Verbal Learning Test-II, DVT = Digit Vigilance Test, Stroop C-W = Stroop Color-Word, TMT = Trail Making Test, WAIS-III = Wechsler Adult Intelligence Scale-III.

Secondary Analyses

Relation Between Zarit Burden Interview and Dementia Severity and Diagnosis

The relation between dementia severity, as measured by MMSE scores, diagnostic category, and caregiver burden was examined. The MMSE [27] was used as a global measure of severity of cognitive impairment, as was done in previous studies. **Figure 1** presents characteristics of diagnostic categories and MMSE scores. Of the original sample, 195 veterans completed the MMSE and had diagnoses available. Results of a hierarchical multiple regression indicated that, after controlling for age and education, MMSE scores contributed a small but statistically significant portion of the variance (R^2 change = 0.043, $p < 0.01$) in ZBI total score. Diagnostic category did not contribute a significant portion of variance over and above age, education, and MMSE score (**Table 5**).

**Figure 1.**

Mean Zarit Burden Interview (ZBI) total score by Mini-Mental Status Examination (MMSE) severity grouping. Note: $n = 196$. Severe impairment = < 9 , moderate impairment = 10–20, mild impairment = 21–24, and within normal limits = 25–30.

Relation Between Zarit Burden Interview and Total Number of Impaired Neuropsychological Tests

Finally, exploratory analyses to understand the effect of impaired neuropsychological test scores on reported burden levels was conducted. Impairment was defined as 1 SD below the mean. Scores were dichotomized as impaired or not impaired, and then aggregate variables were created for total number of impaired test scores and number of impaired test scores in the domains of processing speed and working memory (WAIS-III Coding subtest, WAIS-III Digit Span subtest, and TMT Part A), memory (CVLT-II 1–5 Learning Trials Total, CVLT-II Short Delay Free Recall, and CVLT-II Long Delay Free recall), and executive functioning (Phonemic Fluency, Semantic Fluency, and TMT Part B). Stroop scores were not included because standardized scores were not available. The average number of impaired tests in the no/minimal burden category were as follows: 1.25 (executive), 1.82 (memory), 1.62 (processing speed), and 4.27 (total). The average number of impaired tests in the mild burden category were as follows: 1.68 (executive), 1.97 (memory), 1.85 (processing speed), and 5.64 (total). The average number of impaired tests for the moderate/severe burden range were as follows: 1.82 (executive), 2.50 (memory), 1.95 (processing speed) and 6.40 (total) (**Figure 2**). While the total number of measures in the impaired range increased in a predictable manner with higher reported burden, a nonparametric Kruskal-Wallis was nonsignificant

Table 5.
Hierarchical regression for predicting Zarit Burden Interview total score.

Variable	Model 1			Model 2			Model 3		
	B	SE B	β	B	SE B	β	B	SE B	β
Age	-0.05	0.11	-0.033	-0.12	0.11	-0.08	-0.11	-0.11	-1.02
Education	-0.07	0.39	-0.013	0.00	0.39	0.00	0.00	0.34	0.01
MMSE Score				-0.76	0.26	-0.21*	-0.77	0.26	-2.94*
Diagnosis							0.01	0.42	0.02
R^2		0.001			0.044			0.045	
F for Change in R^2		0.11			8.70*			0.06	

Note: $n = 196$.

* $p < 0.01$.

MMSE = Mini-Mental State Examination, SE = standard error.

($p > 0.05$). It is important to note that this final exploratory analysis was done on a much smaller sample ($n = 79$), because there was a large listwise deletion for Veterans not completing an identical battery of tests.

DISCUSSION

Caregiver burden has been associated with many negative consequences, including depression, feelings of

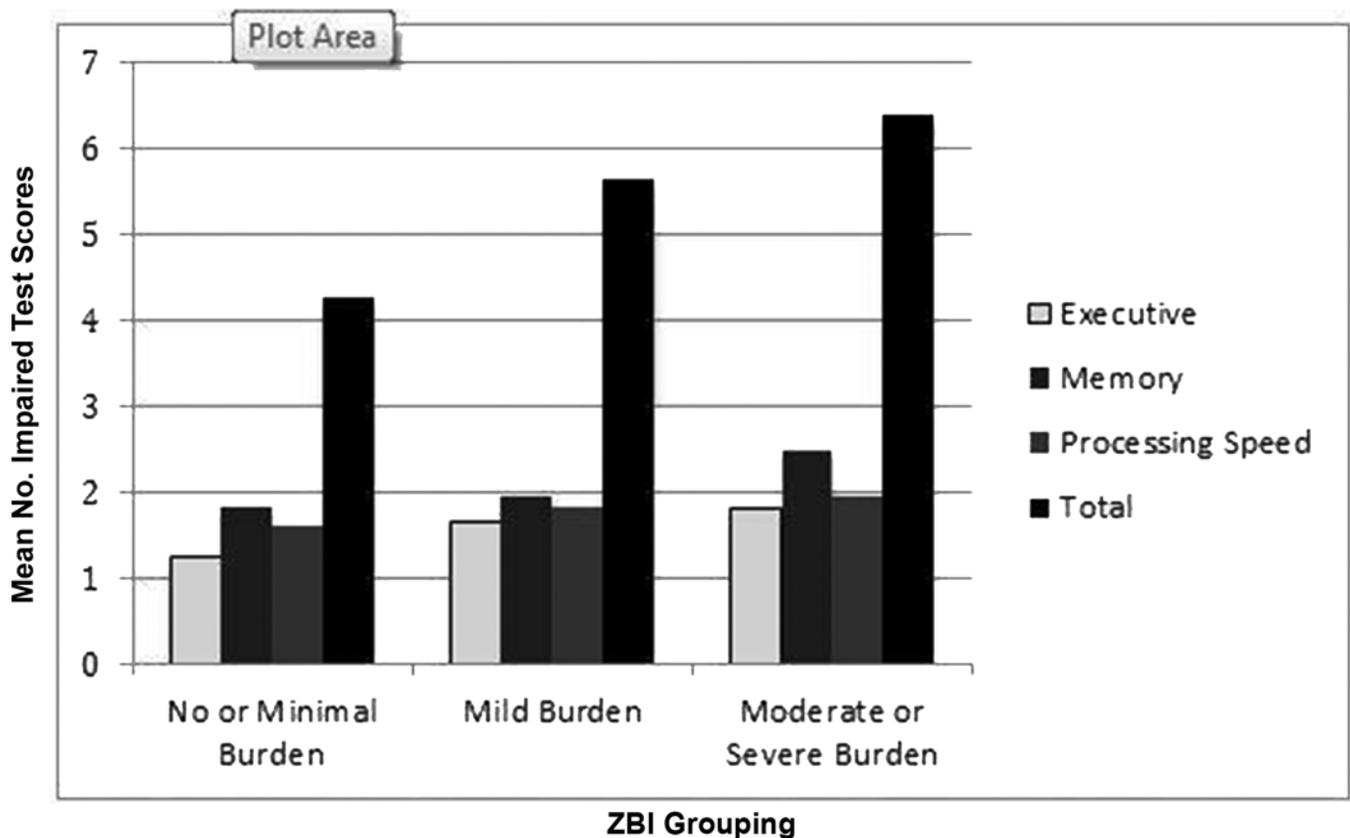


Figure 2.
Mean number of impaired test scores by Zarit Burden Interview (ZBI) grouping. Note: $n = 79$. No burden = 0–20, minimal burden = 21–40, and moderate or severe burden = ≥ 41 .

isolation, and physical health problems [2–4]. As the population begins to age, there is a concomitant increase in the population of individuals with cognitive impairment and dementia. Thus, the number of caregivers is also growing. Within the Department of Veterans Affairs (VA), specifically, prevalence of dementia (all levels of severity) is estimated to be approximately 275,000 annually over the next decade, with an average annual incidence of 89,000 [28]. This will inevitably lead to an increase in caregiver burden and a focus on mitigating its interpersonal, social, and financial costs. As such, it is important for clinicians to have a reliable measure of caregiver burden. Consistent with previous literature describing caregiver burden as a multidimensional construct, a principal components analysis of the ZBI revealed a three-factor structure. The three factors identified in our study (psychosocial burden, dependency burden, and guilt) represent three potential intervention targets for clinicians and researchers helping to assist in reducing the negative effects of these features.

The psychosocial burden factor represents a domain of caregiver burden that is primarily affective. This factor relies heavily on the emotional reaction of the caregiver to the demands of his or her new role. The second factor, dependency burden, assesses the more tangible effects of becoming a caregiver, such as losing time, money, or personal health. Finally, the guilt factor contains items that assess how well the caregiver thinks he or she is meeting the standards of an “ideal” caregiver. Of the three factors, the majority of items loaded on the psychosocial burden factor. In contrast, the guilt factor is only represented by three items, which, from a psychometric standpoint, makes this the most unreliable factor [29]. Additionally, two items of the guilt subscale have a much higher factor loading than the third. However, the three factors revealed in the current study correspond well to those found by Knight et al. [10], namely, embarrassment/anger, patient’s dependency, and self-criticism. Thus, despite flaws in the guilt factor identified in the current study, the ZBI is thought to represent three distinct dimensions of caregiver burden.

While the relation between global dementia severity and caregiver burden has been evaluated, we believe this to be the first study to demonstrate a link between patient performance on specific cognitive measures and supporting factor structure of the ZBI. Partial correlations, controlling for age and education, demonstrated decreased cognitive functioning to be most strongly associated with

the dependency burden dimension of caregiver burden. Although the strength of the correlations are modest, that only cognitive measures were significantly and solely correlated with the dependency burden is meaningful, both in terms of supporting the factor construct and relating patient changes in cognition to caregiving burden despite having items that do not directly ask about cognition. We believe the dependency burden factor contains items that are associated with strained tangible resources (e.g., utilization of time and money), while the psychosocial burden factor contains more affect-related items (e.g., feeling angry or embarrassed). Our findings would suggest that the patients’ clinical status has a more direct tie with utilization of their surrounding time and financial resources, whereas caregivers’ own psychosocial makeup drives their affective and guilt reactions to the caregiving role. This finding may be particularly salient in a VA hospital, where many of the patients are of low socioeconomic status. Illnesses that require caregiving place an additional burden on already strained resources. Another possible explanation for the lack of significant correlations between neuropsychological testing and the guilt and psychosocial burden factors is that each factor represents types of burden that are experienced differently as the care-receiver’s illness progresses. For example, in our sample of Veterans, the mean MMSE score was 24, which is higher than in previous caregiver burden studies (e.g., Lee et al. [7], in which they ranged from 15.8 to 19.7) and reflects lower dementia severity as a whole. Thus, our findings would suggest that in the early stages of cognitive impairment or dementia, dependency burden is driven by cognitive impairment, but as impairment progresses, psychosocial burden and guilt may be more strongly related to other patient factors.

Research on the relationship between caregiver burden and illness severity has been inconsistent [6]. Results of post hoc analyses revealed that severity of illness, as measured by the MMSE, predicted a small but significant amount of variance in caregiver burden scores. The literature suggests that compromised IADLs, psychotic symptoms, and behavioral acting out may moderate or mediate the relationship between illness severity and caregiver burden [6]. The higher MMSE scores of participants in the current study likely correspond to more functional day-to-day IADL participation and fewer psychotic and behavioral features that may be more prevalent in later stages of the diseases. This is tentatively supported in the current study by the trend of increased caregiver burden

scores as MMSE score decreased and by the increase in caregiver burden reported as number of impaired neuropsychological test results increased. While the MMSE is not an appropriate substitution for neuropsychological evaluation in diagnosing dementia, its role as a screener could assist clinicians in identifying those patients whose caregivers may need their own intervention. This may be particularly relevant to those professionals practicing in an interdisciplinary setting. The MMSE is an instrument that is quick and easy to administer, thereby increasing the likelihood that professionals will utilize it and make appropriate referrals.

It is interesting to note that diagnostic category type did not predict a significant amount of variance of caregiver burden scores, although this may be related to having relatively fewer patients with diagnoses characterized by motor and/or psychiatric dysfunction (e.g., synucleinopathies). We believe this highlights the complex relationship of severity of symptoms, diagnosis type, and caregiver burden. Additional studies with more varied samples are needed to investigate the extent to which severity of illness may affect caregiver burden within each diagnostic category. From an intervention standpoint, caregivers may be better served by giving consideration to both type and severity of the dependent's illness rather than designing omnibus interventions for caregivers irrespective of these features. Certainly, an intervention targeting issues surrounding mobility and environmental safety will be more pertinent for families of a person with newly diagnosed Parkinson disease. In contrast, a family caring for a member with moderate to advanced Alzheimer disease dementia may require information related to behavioral management. Finally, interventions targeting mild cognitive impairment may consist of basic education about disease course and progression, awareness of available resources, and information as to healthy behaviors for caregivers. Because patients at this stage are generally cognitively intact, they may be able to take an active role in the interventions.

One of the most robust correlations was between depressive symptoms in the patient and dependency burden of the caregiver, which is consistent with previous research findings that mood disturbances lead to higher caregiver burden [7]. Thus, the burden experienced by caregivers may be multifactorial, encompassing both changes in cognitive functioning and patient changes in mood. This particular finding has important implications for clinicians working with a geriatric population. It is

possible that targeting depressive symptoms in patients will not only benefit the patients, but also decrease the amount of burden experienced by the caregiver. In our clinical experiences, many caregivers may attribute decreased cognitive functioning to the underlying disease process and miss potentially treatable comorbidities such as depression that could improve patient and caregiver quality of life. This knowledge may instill hope for a more fulfilling future with the care-receiver, and, possibly, decrease caregiver burden.

While the current study provides clarification for the factor structure of the ZBI, as well as a foundation for future research, there are important limitations that need to be noted. The study sample included an overwhelming majority of male care-receivers and female caregivers. While this brings a focused understanding of this caregiver relationship, the results likely cannot be generalized to a population of female care-receivers. It is possible that the relationship of caregiver burden and cognitive functioning is qualitatively different between male and female populations. Information regarding length of time since diagnosis and length of time caregiving would provide an additional richness to the data. It is likely that cognitive impairment, a primary focus of this study, is positively correlated with duration of illness. Future research in this area is warranted, and particularly, a longitudinal design tracking the rate of caregiver burden as cognitive impairment progresses may give clinicians unique insights into the caregiver-patient dynamic. Collecting information regarding socioeconomic status would also allow for researchers and clinicians to determine the possible role of this potentially confounding variable. Follow-up statistical analyses were limited due to the small sample size. Having larger numbers within each category would have allowed for more advanced analyses and clearer implications. As noted previously, a wider spectrum of neurological diagnoses would aid in evaluating differential burden related to motoric, psychiatric, and/or behavioral changes. Finally, as the data were gathered at a single time point, causality cannot be established.

CONCLUSIONS

Caregiver burden is an important construct for geriatricians, neurologists, psychologists, and neuropsychologists to understand and routinely measure. Ideally,

caregivers with increased burden (e.g., depression, physical complaints) should be identified and directed toward appropriate treatment venues, because both caregivers and care-receivers are likely to experience negative consequences. We believe the caregiver experience is often overlooked in neuropsychological assessment and that neuropsychologists should work to monitor caregiver burden and prevent its negative consequences. The current study demonstrates that the ZBI is a sensitive enough measure to detect caregiver burden among a relatively high-functioning, mixed clinical sample. More research is needed to fully understand the complex relationship among caregiver burden, illness severity, and type of diagnosis. However, the current study has important implications for future research and for interventions to reduce caregiver burden and presents a foundation for more detailed research on caregiver burden.

ACKNOWLEDGMENTS

Author Contributions:

Study concept and design: J. M. Stinson, R. L. Collins, K. L. Maestas, A. LeMaire.

Acquisition of data: R. L. Collins, K. L. Maestas, A. LeMaire.

Analysis and interpretation of data: J. M. Stinson, R. L. Collins, K. L. Maestas, V. Pacheco.

Drafting of manuscript: J. M. Stinson, R. L. Collins.

Critical revision of manuscript for important intellectual content: J. M. Stinson, R. L. Collins, J. Bengé.

Statistical analysis: J. M. Stinson, K. L. Maestas.

Administrative, technical, or material support: J. M. Stinson, R. L. Collins, K. L. Maestas, V. Pacheco, A. LeMaire, J. Bengé.

Study supervision: R. L. Collins.

Financial Disclosures: No author has any financial or other relationships that could be interpreted as a conflict of interest affecting this manuscript. No sources of financial support were used in completing this research.

Funding/Support: This material is the result of work supported with resources and the use of facilities at MEDVAMC, Houston, Texas.

Additional Contributions: Dr. LeMaire is now a clinical neuropsychologist with Stuart J. Nathan, PhD & Associates.

Institutional Review: The institutional review boards of MEDVAMC and Baylor College of Medicine approved this research, and the authors have fully complied with APA ethical standards throughout this research project.

Participant Follow-Up: The authors do not plan to inform participants of the publication of this study because contact information is unavailable.

REFERENCES

- Berger G, Bernhardt T, Weimer E, Peters J, Kratzsch T, Frolich L. Longitudinal study on the relationship between symptomatology of dementia and levels of subjective burden and depression among family caregivers in memory clinic patients. *J Geriatr Psychiatry Neurol.* 2005;18(3):119–28. [PMID:16100100] <http://dx.doi.org/10.1177/0891988704273375>
- Germain S, Adam S, Olivier C, Cash H, Ousset PJ, Andrieu S, Vellas B, Meulemans T, Reynish E, Salmon E; ICTUS-EADC Network. Does cognitive impairment influence burden in caregivers of patients with Alzheimer's disease? *J Alzheimers Dis.* 2009;17(1):105–14. [PMID:19494435]
- Flynn Longmire CV, Knight BG. Confirmatory factor analysis of a brief version of the Zarit Burden Interview in Black and White dementia caregivers. *Gerontologist.* 2011;51(4):453–62. [PMID:21402646] <http://dx.doi.org/10.1093/geront/gnr011>
- Pinquart M, Sörensen S. Associations of stressors and uplifts of caregiving with caregiver burden and depressive mood: A meta-analysis. *J Gerontol B Psychol Sci Soc Sci.* 2003;58(2):112–28. [PMID:12646594] <http://dx.doi.org/10.1093/geronb/58.2.P112>
- Yeager CA, Hyer LA, Hobbs B, Coyne AC. Alzheimer's disease and vascular dementia: The complex relationship between diagnosis and caregiver burden. *Issues Ment Health Nurs.* 2010;31(6):376–84. [PMID:20450339] <http://dx.doi.org/10.3109/01612840903434589>
- Hickey C, Chisholm T, Passmore MJ, O'Brien JD, Johnston J. Differentiating the dementias. Revisiting synucleinopathies and tauopathies. *Curr Alzheimer Res.* 2008;5(1):52–60. [PMID:18288932] <http://dx.doi.org/10.2174/156720508783884657>
- Lee DR, McKeith I, Mosimann U, Ghosh-Noddyal A, Thomas AJ. Examining carer stress in dementia: The role of subtype diagnosis and neuropsychiatric symptoms. *Int J Geriatr Psychiatry.* 2013;28(2):135–41. [PMID:22422615] <http://dx.doi.org/10.1002/gps.3799>
- Nasreddine ZS, Phillips NA, Bédirian V, Charbonneau S, Whitehead V, Collin I, Cummings JL, Chertkow H. The Montreal Cognitive Assessment, MoCA: A brief screening tool for mild cognitive impairment. *J Am Geriatr Soc.* 2005;53(4):695–99. [PMID:15817019] <http://dx.doi.org/10.1111/j.1532-5415.2005.53221.x>
- Bachner YG, O'Rourke N. Reliability generalization of responses by care providers to the Zarit Burden Interview. *Aging Ment Health.* 2007;11(6):678–85. [PMID:18074255] <http://dx.doi.org/10.1080/13607860701529965>

10. Knight BG, Fox LS, Chou, CP. Factor structure of the burden interview. *J Clin Geropsych.* 2000;6(4):249–58. <http://dx.doi.org/10.1023/A:1009530711710>
11. Zarit SH, Reever KE, Bach-Peterson J. Relatives of the impaired elderly: Correlates of feelings of burden. *Gerontologist.* 1980;20(6):649–55. [PMID:7203086] <http://dx.doi.org/10.1093/geront/20.6.649>
12. George LK, Gwyther LP. Caregiver well-being: A multidimensional examination of family caregivers of demented adults. *Gerontologist.* 1986;26(3):253–59. [PMID:3721232] <http://dx.doi.org/10.1093/geront/26.3.253>
13. Novak M, Guest C. Application of a multidimensional caregiver burden inventory. *Gerontologist.* 1989;29(6):798–803. [PMID:2516000] <http://dx.doi.org/10.1093/geront/29.6.798>
14. Hébert R, Bravo G, Preville M. Reliability, validity and reference values of the Zarit Burden Interview for assessing informal caregivers of community-dwelling older persons with dementia. *Can J Aging.* 2000;19(4):494–507. <http://dx.doi.org/10.1017/S0714980800012484>
15. Whitlatch CJ, Zarit SH, von Eye A. Efficacy of interventions with caregivers: A reanalysis. *Gerontologist.* 1991;31(1):9–14. [PMID:2007480] <http://dx.doi.org/10.1093/geront/31.1.9>
16. Kaplan E, Goodglass H, Weintraub S. *The Boston Naming Test.* 2nd ed. Philadelphia (PA): Lea & Febiger; 1983.
17. Delis DC, Kaplan E, Kramer JH, Ober BA. *California Verbal Learning Test—Second Edition (CVLT-2) manual.* San Antonio (TX): Psychological Corporation; 2000.
18. Reitan RM, Wolfson D. *The Halstead-Reitan Neuropsychological Test Battery.* Tucson (AZ): Neuropsychology Press; 1993.
19. Wechsler D. *Wechsler Adult Intelligence Scale—3rd Edition (WAIS-III).* San Antonio (TX): Psychological Corporation; 1997.
20. Stroop JR. Studies of interference in serial verbal reactions. *J Exp Psychol.* 1935;18(6):643–62. <http://dx.doi.org/10.1037/h0054651>
21. Kelland DZ, Lewis RF. The Digit Vigilance Test: reliability, validity, and sensitivity to diazepam. *Arch Clin Neuropsychol.* 1996;11(4):339–44. [PMID:14588938] <http://dx.doi.org/10.1093/arclin/11.4.339>
22. Sánchez-Cubillo I, Periañez JA, Adrover-Roig D, Rodríguez-Sánchez JM, Ríos-Lago M, Tirapu J, Barceló F. Construct validity of the Trail Making Test: Role of task-switching, working memory, inhibition/interference control, and visuomotor abilities. *J Int Neuropsychol Soc.* 2009;15(3):438–50. [PMID:19402930] <http://dx.doi.org/10.1017/S1355617709090626>
23. Mitrushina M. *Handbook of normative data for neuropsychological assessment.* New York (NY): Oxford University Press; 2005.
24. Beck AT, Steer RA, Brown GK. *Manual for the Beck Depression Inventory-II.* San Antonio (TX): Psychological Corporation; 1996.
25. Kaiser HF. An index of factorial simplicity. *Psychometrika.* 1974;39:31–36. <http://dx.doi.org/10.1007/BF02291575>
26. Bartlett M. A note on the multiplying factors for various chi square approximations. *J R Stat Soc [Ser A].* 1954;16:296–98.
27. Folstein MF, Folstein SE, McHugh PR. “Mini-mental state”. A practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res.* 1975;12(3):189–98.
28. Projections of the prevalence and incidence of dementias including Alzheimer’s disease for the total, enrolled, and patient veteran populations age 65 or over [Internet]. Washington (DC): Office of the Assistant Deputy Under Secretary of Health; 2004 Feb 20. Available from: <http://www4.va.gov/healthpolicyplanning/dementia/Dem022004.pdf>
29. Worthington RL, Whittaker TA. Scale development research: A content analysis and recommendations for best practice. *Couns Psychol.* 2006;34:806–38. <http://dx.doi.org/10.1177/0011000006288127>

Submitted for publication November 12, 2013. Accepted in revised form May 13, 2014.

This article and any supplementary material should be cited as follows:

Stinson JM, Collins RL, Maestas KL, Pacheco V, LeMaire A, Bengtson J. Dependency aspect of caregiver burden is uniquely related to cognitive impairment in Veterans. *J Rehabil Res Dev.* 2014;51(8):1177–88. <http://dx.doi.org/10.1682/JRRD.2013.11.0246>



