



Measuring burden in dementia caregivers: Confirmatory factor analysis for short forms of the Zarit Burden Interview



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ABSTRACT

Introduction: To examine the psychometric properties of different short versions of the Zarit Burden Interview (ZBI), and to find an efficient and valid short version for clinical use among dementia caregivers.

Materials and methods: A total of 270 Taiwanese dementia caregivers filled out the full form of the ZBI, which contains 22 items. Using the 22-item ZBI, we used confirmatory factor analysis (CFA) to calculate the fit indices of all proposed short versions with various items to determine useful short versions. Additional associations between each useful short version and informal care hours, as well as subjective financial situations, were examined to understand their concurrent validity.

Results: Based on the CFA results, three short versions of the ZBI, performed excellently (4-item version: comparative fit index [CFI] = 1.000, Tucker-Lewis index [TLI] = 1.035, standardized root mean square residual [SRMR] = 0.019, and root mean square error of approximation [RMSEA] = 0.000; 8-item version: CFI = 0.970, TLI = 0.958, SRMR = 0.045, and RMSEA = 0.065; 12-item version: CFI = 0.959, TLI = 0.950, SRMR = 0.053, and RMSEA = 0.075). In addition, the 12-item ZBI, as compared with other versions, had a higher correlation with the number of informal care hours. The 12-item ZBI was also highly correlated with the original 22-item ZBI ($r = 0.952$).

Conclusions: We found the 12-item ZBI to be a promising measure for healthcare providers to assess the burden of dementia caregivers quickly and efficiently.

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1. Introduction

Caring for people with dementia, including Alzheimer's disease, is very likely to present a severe burden for caregivers because of the need to provide continuous day-to-day supervision and care, including assistance with the patients' activities of daily living (ADLs) and instrumental ADLs (IADLs) (Ankri, Andrieu, Beaufils, Grand, & Henrard, 2005). Moreover, such caregivers need to tolerate and cope with the inappropriate and/or violent behaviors from their relatives suffering from Alzheimer's disease (Zarit,

Reever, & Bach-Peterson, 1980). While caregivers often cooperate with healthcare professionals to provide better treatment (Chang et al., 2015), those with severe burden may be less capable to work with healthcare professionals, and in extreme cases this can even jeopardize the health of caregivers (Schreiner, Morimoto, Arai, & Zarit, 2006; Zarit, Todd, & Zarit, 1986). Assessing caregiver burden may thus help healthcare professionals to prevent both caregivers and patients from the worst outcomes in this context.

The Zarit Burden Interview (ZBI) is one of the most commonly used scales that measure caregiver burden. However, the structure of the ZBI has been debated for decades. Some studies propose using a multidimensional structure, ranging from two to five factors (Ankri et al., 2005; Bédard et al., 2001; Cheah, Han, Chong, Anthony, & Lim, 2012; Cheng, Kwok, & Lam, 2014; Knight, Fox, & Chou, 2000; Ko, Yip, Liu, & Huang, 2008). In contrast, others propose a unidimensional structure using short form of the ZBI

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with the number of items ranging from four to 12 (Arai, Tamiya, & Yano, 2003; Bédard et al., 2001; Ballesteros et al., 2012; Gort et al., 2005, 2010; Higginson, Gao, Jackson, Murray, & Harding, 2010). The various recommendations in the literature make it difficult for healthcare professionals to decide which structure and/or version of ZBI should be used. Some researchers have noted the problem of diverse structures in ZBI, and thus compared the different structures of ZBI (Cheng et al., 2014; Knight et al., 2000).

The benefits of multidimensionality for the ZBI are obvious; for example, measurements of caregiver burden being multidimensional can provide more holistic and precise results, because caregivers with an identical score may have burdens that differ in certain aspects (Cheah et al., 2012). Unfortunately, the debate on multidimensional structures of the ZBI is yet to be resolved, and it is very likely that different structures will be needed in different cultures, especially in Western versus Eastern contexts. Cultural values significantly influence the coping styles of caregivers, their interpretations of social support, and how they express emotional distress (Knight & Sayegh, 2010). That is, culture factors may account for the diverse results of the multidimensional structures of the ZBI, though we still cannot identify which specific culture characteristics are involved. As a result, the current problem is that there is no consistent structure of the ZBI for healthcare providers to utilize. Several studies (Cheng et al., 2014; Knight et al., 2000; Longmire & Knight, 2011; Lu, Wang, Yang, & Feng, 2009; Siegert, Jackson, Tennant, & Turner-Stokes, 2010) have used CFA to compare different ZBI structures, and their results are not comparable. For example, Cheng et al. (2014) finally suggested a 4-factor structure with 18 items, while Knight and Sayegh (2010) proposed a 3-factor structure with 14 items.

Because of the uncertainty of the structure, we propose to use a short version of unidimensional ZBI measuring the global burden instead. By using a short form of the ZBI, healthcare providers would need significantly less time to evaluate caregiver burden, and this process would also be easier for caregivers. In other words, using a good short version can be premised on ease of administration and possibly screening in busy clinical settings or intervention/population studies. We also justify the reasons of adopting a short version include (1) being a surrogate of role strain, personal strain and total ZBI score; (2) being potentially constituted by few items. Nevertheless, there are currently different versions of unidimensional ZBI and further efforts are needed for version selection.

The main purpose of this study was to compare six proposed unidimensional ZBI in a sample of Taiwan caregivers for dementia patients using confirmatory factor analysis (CFA), and to determine which version was the most suitable in this context.

2. Method

2.1. Participants and procedure

We recruited 286 dementia patient-caregiver dyads at the dementia clinic in a national university hospital in southern Taiwan from November 2013 to April 2015. We included patients whose medical records contained a diagnosis of dementia according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria. Dementia subtypes included mostly Alzheimer's disease ($n=224$), but also dementia with Lewy bodies ($n=9$), vascular dementia ($n=6$), and other unspecified types. The inclusion criteria required that dementia patients were living in the community and had an informal caregiver. The caregiver of the dementia patient must be a family member who had cared for the patient for at least 12 months, be ≥ 18 years of age, and fluent in either Mandarin or Taiwanese. After excluding 10 patients who moved to a nursing home, four

withdrawals, and two incomplete responses, our final sample included 270 community-dwelling dyads. Ethical approval was obtained from the National Cheng Kung University Hospital Institutional Review Board before this study began (IRB No: B-ER-102-173). Data were collected using telephone interviews with caregivers after obtaining written consent for the study from the caregivers and the patients. For cognitively impaired patients who could not provide their signatures, proxy consent was obtained from their family caregiver.

We collected data on baseline demographics (age, gender, and educational level), marital status, and relationship to the patient from caregivers using questionnaires. The ZBI (Zarit et al., 1980) assessed subjective caregiver burden, while unpaid caregiver (informal care) time was collected using Resource Utilization in Dementia (RUD) instrument (Wimo et al., 2013). Informal care time was categorized into hours spent on Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), and supervision for the person with dementia in the past week before the interview. Moreover, one survey question on financial burden ("Does your family have difficulty paying living expenses every month?") was used as a criterion for testing known-group validity.

2.2. Zarit Burden Interview (ZBI)

All 22 items on the ZBI are rated on a 5-point scale from 0 (*not at all*) to 4 (*extremely*), and a higher ZBI score indicates a higher level of caregiver burden. The internal consistency of the ZBI has been reported as satisfactory ($\alpha = 0.92$; Hébert, Bravo, & Prévaille, 2000), including the Chinese version for Taiwanese subjects ($\alpha = 0.89$; Ko et al., 2008). Moreover, the test-retest reliability for a two-week interval is excellent for the Chinese version of the ZBI (intraclass correlation coefficient = 0.88; Ko et al., 2008). The most used two domains of the ZBI are personal strain and role strain. In the current study we also found that the internal consistency was adequate for 22 items ($\alpha = 0.855$), and the item descriptions are presented in the Appendix. In addition, we compared the psychometric properties of the following six short versions: 4-item (Bédard et al., 2001; Gort et al., 2005), 6-item (Higginson et al., 2010), 7-item (Gort et al., 2010), 8-item (Arai et al., 2003), and 12-item (Ballesteros et al., 2012). The reason of not including other existed short ZBI (e.g., Cheng et al., 2014; Longmire & Knight, 2011) is we tried to compare the versions with 12 or fewer items and derived using the uni-dimensional approach.

2.3. Statistical analysis

We examined six CFA single-factor models and performed their fit statistics. All models were estimated using maximum likelihood estimation based on absolute skewness (0.027–1.979) and kurtosis (0.297–3.089) values of less than 3 and 8, respectively, suggesting a normal distribution (Kline, 2005; Lin, Luh, Cheng, Yang, & Ma, 2014). The χ^2 should be nonsignificant to indicate a good data-model fit, but we did not use this statistic to assess the fit of any model, as it is too sensitive to a large sample size (Wu, Chang, Chen, Wang, & Lin, 2015). Therefore, we used the following fit indices instead: comparative fit index (CFI), Tucker-Lewis index (TLI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA). The values of CFI and TLI that are > 0.95 , and of the SRMR and RMSEA that are < 0.05 suggest excellent data-model fit, while alternatives of > 0.90 and < 0.08 suggest acceptable fit (Cheng et al., 2014; Tsai et al., 2015).

Using the above fit statistics, we aimed to determine which model had all indices that were acceptable and/or excellent. If the results showed that there were several acceptable models, we then compared their factor loadings, internal consistency using Cronbach's α , and their correlations with the average scores of

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