LETTER TO THE EDITOR

ZBI multidimensionality: The salience of worry about performance

We read with interest the study by Smith *et al.* (2018) among 110 family caregivers of persons with dementia that affirmed the multidimensionality of burden as measured by the Zarit Burden Interview (ZBI) (Lau *et al.*, 2015). Factor analysis identified three factors (53.45% of total variance), namely direct impact of caregiving, uncertainty over the future, and frustration/embarrassment.

We suggest that these findings need to be interpreted in light of the extant literature. Prior studies in diverse Asian and Caucasian populations that examined the factor structure of ZBI report a range of three to five factors, accounting for 52.4 to 62.8% of total variance (Table 1). A large proportion consists of factors depicted by role and personal strain. In addition, a distinct factor has consistently been described that involves items 20 ("doing more") and 21 ("doing better") and independently explains 5.0 to 14.8% of total variance. This factor represents a conceptual continuum of worry about caregiving performance (WaP), ranging from "inadequacy" and "worry" through to more severe degrees of "self-criticism" and "guilt."

Recent studies corroborate the existence of WaP as a distinct dimension of burden among adult children caregivers, which may be particularly salient in Asian societies that are often heavily influenced by notions of filial piety and obligatory care (Cheah *et al.*, 2012). Unlike role and personal strain, WaP is poorly correlated with other factor scores, significantly endorsed even in milder stages of cognitive impairment and is not predicted by "conventional" factors such as functional impairment and behavioral problems (Lim *et al.*, 2014). In support of this, a recent confirmatory factor analysis revealed that ZBI factor models premised on the three key dimensions of role strain, personal strain, and WaP were superior to one-factor (total score) and two-factor (role/personal strain) models (Li *et al.*, 2018).

We postulate that WaP may have been missed in Smith's study due to small sample size and inadvertent spectrum bias. In smaller samples, the correlation coefficients among variables are less reliable, affecting the generalizability of these factors. For small samples, one would be more confident if factor solutions have several high loading variables above 0.80 – which is not the case for "uncertainty" or "frustration" factors. The response rate of 21.5% inadvertently selected a group of predominantly spousal caregivers (80.9%) who likely provided direct hands-on care and for whom WaP would understandably be less relevant compared to adult children caregivers who may not be the ones providing direct care. The greater dementia severity (mean DEX: 43.6) of care recipients along with concomitant behavioral, functional, and cognitive issues would also contribute to the correspondingly higher level of burden (mean ZBI: 41.6) compared to that observed in earlier studies (Table 1). This spectrum bias may have resulted in the problematic correlation values and omission of five items including items 20 and 21.

We are thus inclined to conclude that the three derived factors reported in the study by Smith *et al.* (2018) may in fact represent variants of role strain (impact and uncertainty) and personal strain (frustration/embarrassment) with the omission of WaP. Taken together, we therefore caution against premature conclusions about the omission of WaP from the multidimensionality of ZBI burden.

Conflict of interest

None.

References

Al-Rawashdeh, S. Y., Lennie, T. A. and Chung, M. L. (2016). Psychometrics of the Zarit Burden Interview in caregivers of patients with heart failure. *The Journal of Cardiovascular Nursing*, 31, E21–E28. doi: 10.1097/JCN .0000000000000348.

Table 1. Summary of factor structure of the Zarit Burden Interview (ZBI)

	SMITH (2018) (N = 110)	LI (2017) (N = 566)	TANG (2017) (N = 324)	AL-RAWASHDEH (2016) (N = 124)	SPRINGATE (2014) (N = 206)	CHEAH (2012) (N = 130)	CHATTAT (2011) (N = 273)	LEGGETT (2011) (N = 611)	LU (2009) (N = 523)	KO (2008) (N = 168)	LAI (2007) (N = 339)	ANKRI (2005) (N = 152)	KNIGHT (2000) (N = 220)
Mean ZBI score (SD)	41.6 (14.2)	26.9 (15.9)	–	15.8 (12.3)	38.0 (14.2)	18.9 (16.5)	33.4 (15.9)	–	–	35.5 (14.4)	–	32.9 (17.9)	–
F1	Impact on caregiver's life (43.3%)	Role strain (40.2%)	Negative emotion (32.2%)	Consequences of caregiving (40.2%)	Impact on caregiver's life (35.0%)	Demands of care and social impact on the caregiver (30.5%)	Personal & role strain (35%)	Role strain (25.5%)	Sacrifice (28.7%)	Over-sacrifice (16.8%)	Sacrifice and strain (32.8%)	Consequences on caregivers' daily social and personal life (41.5%)	Embarrassment or anger (41.2%)
F2	Uncertainty over future (5.7%)	Personal strain (8.3%)	Interpersonal relationship (8.4%)	Patient's dependence (9.2%)	Guilt (8.8%) [5, 19, 20, 21]	Confidence or control over situation (9.7%)	Loss of control (9%)	Personal strain (14.9%)	Loss of control (9.1%)	Patient's dependency (13.8%)	Inadequacy (8.4%) [20, 21]	Psychological burden and emotional reactions (8.6%)	Self-criticism (8.4%) [20, 21]
F3	Frustration or embarrassment (4.4%)	Incompetency (5.6%)	Time demand (8.1%)	Exhaustion and uncertainty (7.4%)	Frustration or embarrassment (7.4%)	Psychological impact on caregiver (9.7%)	Embarrassment or anger (5%)	Worry about performance (14.8%) [7, 19, 20, 21]	Embarrassment or anger (7.5%)	Negative emotions (13.1%)	Embarrassment or anger (4.4%)	Guilt (6.2%) [15, 16, 20, 21]	Patient's dependency (6.1%)
F4	–	Patient's dependency (4.5%)	Patient's dependence (6.8%)	Guilt and fear for the patient's future (6.0%) [7, 20, 21]	–	Worry about performance (5.6%) [20, 21]	Uncertainty and guilt (5%) [7, 19, 20, 21]	–	Self-criticism (6.2%) [20, 21]	Caregiver's feeling of inadequacy (10%) [20, 21]	Dependency (3.5%)	–	–
F5	–	Guilt (4.2%) [20, 21]	Self-accusation and guilt (5.1%) [20, 21]	–	–	–	Financial strain (5%)	–	Dependency (5%)	Uncertainty about patient's future (6.3%)	Loss of control (3.3%)	–	–
Total variance explained	53.5%	64.0%	60.5%	62.8%	62.0%	62.2%	59.0%	55.2%	56.5%	60.0%	52.4%	56.3%	55.7%

All figures correct to 1 decimal place. (%): Amount of variance explained by each factor. [ ]: Question numbers from the ZBI questionnaire.

Ankri, J., Andrieu, S., Beaufils, B., Grand, A. and Henrard, J. C. (2005). Beyond the global score of the Zarit Burden Interview: useful dimensions for clinicians. *International Journal of Geriatric Psychiatry*, 20, 254–260. doi: 10.1002/gps.1275.

Chattat, R. *et al.* (2011). The Italian version of the Zarit Burden interview: a validation study. *International Psychogeriatrics*, 23, 797–805. doi: 10.1017/S1041610210002218.

Cheah, W. K., Han, H. C., Chong, M. S., Anthony, P. V. and Lim, W. S. (2012). Multidimensionality of the Zarit Burden Interview across the severity spectrum of cognitive impairment: an Asian perspective. *International Psychogeriatrics*, 24, 1846–1854. doi: 10.1017/S104161021200110X.

Knight, B. G., Fox, L. S. and Chou, C. P. (2000). Factor structure of the Burden Interview. *Journal of Clinical Geropsychology*, 6, 249. doi: 10.1023/A:1009530711710.

Ko, K. T., Yip, P. K., Liu, S. I. and Huang, C. R. (2008). Chinese version of the Zarit caregiver Burden Interview: a validation study. *The American Journal of Geriatric Psychiatry*, 16, 513–518. doi: 10.1097/JGP.0b013e318167ae5b.

Lai, W. L. D. (2007). Validation of the Zarit Burden Interview for Chinese Canadian Caregivers. *Social Work Research*, 31, 45–53. doi: 10.1093/swr/31.1.45.

Lau, S., Chong, M. S., Ali, N., Chan, M., Chua, K. C. and Lim, W. S. (2015). Caregiver burden: looking beyond the unidimensional total score. *Alzheimer Disease and Associated Disorders*, 29, 338–346. doi: 10.1097/WAD.0000000000000085.

Leggett, A. N., Zarit, S., Taylor, A. and Galvin, J. E. (2011). Stress and burden among caregivers of patients with Lewy body dementia. *The Gerontologist*, 51, 76–85. doi: 10.1093/geront/gnq055.

Li, D., Hu, N., Yu, Y., Zhou, A., Li, F. and Jia, J. (2017). Trajectories of multidimensional caregiver Burden in Chinese informal caregivers for dementia: evidence from exploratory and confirmatory factor analysis of the Zarit Burden Interview. *Journal of Alzheimer's Disease*, 59, 1317–1325. doi: 10.3233/JAD-170172.

Li, R., Chong, M. S., Chan, P. C. M., Tay, B. G. L., Ali, N. B. and Lim, W. S. (2018). Worry about caregiving performance: a confirmatory factor analysis. *Frontiers in Medicine*, 5, 79. doi: 10.3389/fmed.2018.00079.

Lim, W. S. *et al.* (2014). Worry about performance: a unique dimension of caregiver burden. 26, 677–686. doi: 10.1017/S1041610213002445.

Lu, L., Wang, L., Yang, X. and Feng, Q. (2009). Zarit caregiver Burden Interview: development, reliability and validity of the Chinese version. *Psychiatry and Clinical Neurosciences*, 63, 730–734. doi: 10.1111/j.1440-1819.2009.02019.x.

Smith, K. J., George, C. and Ferriera, N. (2018). Factors emerging from the "Zarit Burden Interview" and predictive variables in a UK sample of caregivers for people with dementia. *International Psychogeriatrics*, 22, 1–8. doi: 10.1017/S1041610218000315.

Springate. B. A. and Tremont, G. (2014). Dimensions of caregiver burden in dementia: impact of demographic, mood, and care recipient variables. *The American Journal of Geriatric Psychiatry*, 22, 294–300. doi: 10.1016/j.jagp.2012.09.006.

Tang, B. *et al.* (2017). Factor analyses of the Chinese Zarit Burden Interview among caregivers of patients with schizophrenia in a rural Chinese community. *BMJ Open*, 7, e015621. doi: 10.1136/bmjopen-2016-015621.

SABRINA LAU,[1] NOORHAZLINA ALI,[1,2]
JUN PEI LIM[1,2] AND WEE SHIONG LIM[1,2]

[1]Department of Geriatric Medicine, Tan Tock Seng Hospital, Singapore
[2]Institute of Geriatrics and Active Aging, Tan Tock Seng Hospital, Singapore