Psychometric Validation of the Korean Version of the Camberwell Assessment of Need for the Elderly in Individuals with Dementia

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INTRODUCTION

Korea has become one of the fastest aging societies in the world, and the prevalence of dementia has increased rapidly to be one of the highest among all diseases. Considering the complexity of this disease, people with dementia have more needs than those without dementia [1]. In addition, dementia challenges health-care providers as they often exhibit problematic behavior that occurs when their needs are not met [1]. A need presents when a significant problem requires proper interventions that can be met with an appropriate intervention; in contrast, a need remains unmet when assistance was not helpful or no help existed for the problem [2]. Analyzing an individual’s evaluation of their need, health providers are better guided about whether their services were appropriate. Efficient and evidence-based care has prompted service allocation based on need assessment [3]. Thus systematic need assessment for individuals with dementia to identify the majority of their unmet needs can enable health-care providers to better assign appropriate resources.

Researchers have developed various instruments that measure health-care and support-system needs. They include the Camberwell Assessment of Need [4], the Elderly Health Care Needs Assessment Questionnaire (EHCNAQ) [5], Health Needs Assessment Tool [6], the Need of Support and Service Questionnaire [7], and the Montreal Assessment of Needs Questionnaire [8]. These tools, except the EHCNAQ, target health visitors in general and were not designed to measure needs in the elderly. In addition, the EHCNAQ

METHODS: The CANE-K was developed following linguistic validation. The reliability of the measurement was examined with Cronbach α coefficient. The factor structure and construct validity were evaluated by performing exploratory factor analysis and confirmatory factor analyses. Pearson’s correlation coefficients with related measures were used to ensure concurrent validity. Results: Four factors extracted with exploratory factor analysis and confirmatory factor analyses validated the model structure (χ² = 367.25, ρ < .001, goodness-of-fit index = .84, adjusted goodness-of-fit index = .80, root mean square error of approximation = .07, and comparative fit index = .83). Items on the CANE-K loaded on the four factors in a range between .40 and .80. The output of Pearson’s correlation coefficient with cognitive impairment, behavioral problems, activities of daily living, and caregiver burden showed acceptable concurrent validity.

CONCLUSION: The CANE-K showed a reasonable degree of reliability and validity. Therefore, it has good potential to appropriately measure the needs and unmet needs of those with dementia.

Abstract

Purpose: The prevalence of dementia has increased rapidly with an aging Korean population. Compared to those without dementia, individuals with dementia have more and complex needs. In this study, the Korean version of the Camberwell Assessment of Need for the Elderly (CANE-K) was evaluated to determine its suitability for individuals with dementia in Korea.

Methods: The CANE-K was developed following linguistic validation. The reliability of the measurement was examined with Cronbach α coefficient. The factor structure and construct validity were evaluated by performing exploratory factor analysis and confirmatory factor analyses. Pearson’s correlation coefficients with related measures were used to ensure concurrent validity.

Results: Four factors extracted with exploratory factor analysis and confirmatory factor analyses validated the model structure (χ² = 367.25, p < .001, goodness-of-fit index = .84, adjusted goodness-of-fit index = .80, root mean square error of approximation = .07, and comparative fit index = .83). Items on the CANE-K loaded on the four factors in a range between .40 and .80. The output of Pearson’s correlation coefficient with cognitive impairment, behavioral problems, activities of daily living, and caregiver burden showed acceptable concurrent validity.

Conclusion: The CANE-K showed a reasonable degree of reliability and validity. Therefore, it has good potential to appropriately measure the needs and unmet needs of those with dementia.
measures self-reported health by obtaining information focused on health-related complaints in elders [5].

The Camberwell Assessment of Need was adapted especially for older adults and geriatric populations with psychological issues and modified to the Camberwell Assessment of Need for the Elderly (CANE) in the UK. The CANE is a structured and multidimensional need-assessment tool that consists of detailed questions about the nature and severity of problems in each dimension. The CANE is a comprehensive and person-centered instrument developed to avoid inadequate and inappropriate use of the health-care system. Understanding the complexity of needs in older adults with dementia, the CANE investigates the nature of needs, the extent of assistance received for those needs, and the degree of satisfaction with that assistance. On a multidisciplinary team, health-care providers can use the CANE to incorporate the perspectives of a patient’s associates (caregivers and health professionals) as well as people with dementia themselves. The CANE questionnaire helps in identifying where an individual has unmet clinical needs and possible gaps or shortcomings in health-care provision in health-care settings [9].

When individuals with dementia have some degree of cognitive decline, their caregiver’s rating gathers valid information regarding the caregivers’ needs [10]. The CANE acquires information about elders from a variety of individuals—older adults themselves, staff members at care facilities, and caregivers—with the aim of incorporating this information into possible person-centered interventions and care plans [9]. For community-residing individuals with dementia, family caregivers account for the largest share of care provision and often become the source of information on unmet needs. The tasks of dementia caregivers encompass all domains from assisting with daily activities to making decisions on economic and health-care matters [11].

One advantage of the CANE is that it provides the opportunity to identify areas where needs arose but were met with sufficient support, formally and informally. Moreover, using the CANE, needs remained unmet when interventions did not provide support or solutions [9]. The CANE evaluates needs in 24 areas and determines whether “needs” were met or remained unmet. Use of the CANE would enable health-care providers to construct more effective service plans. This assessment provides the domain of identified problems as well as perceived level of need and whether individuals were satisfied with the help received [9]. Using the CANE, possible gaps and shortcomings of current health service can be identified along with individual clinical needs.

The CANE has been translated into various languages and previous research showed good validity. The German version of the CANE was useful in identifying needs in depressed elderly [12]. The CANE was useful in identifying areas where needs were met and unmet among people with dementia and caregivers in the UK [3]. In a study conducted in The Netherlands, validity and feasibility were evaluated in a large sample of people with dementia and their caregivers [13]. In addition, CANE was used to compare caregivers’ needs according to the type of dementia [14].

Despite the increasing body of research that demonstrated many unmet needs in care provision for individuals with dementia [6,7], awareness of its importance among the Korean population is quite limited. In Korea, much of existing measurements evaluate items based on environmental, physical, psychological, and social needs [9,12]. In contrast, a validation study by van der Roest [13] clustered the same items into three categories of (1) autonomy; (2) physical; and (3) psychological, emotional, and social needs. Thus, by conducting factor analysis, this study examined whether these factors can be applicable in a Korean population using the Korean version of CANE (CANE-K). A CANE-K may help health professionals and health-care policymakers identify areas where older adults with health issues have the highest unmet needs.

The purpose of the present study was to examine the psychometric properties of the CANE-K among family caregivers of individuals with dementia. We evaluated construct validity and reliability of the CANE-K examining internal consistency, latent structure, and concurrent validity.

Methods

Study design

A methodological study was conducted to examine validity and reliability of the translated CANE-K.

Participants and study design

This study used data obtained as part of the Seoul Dementia Management Survey (SDMS). The SDMS is a cross-sectional and multidimensional investigation of individuals with dementia and their caregivers on the status of dementia management. The SDMS was conducted from June to August, 2014. The sample was obtained from the randomly selected 656 patients—caregiver dyads who registered on the online database, owned and managed by Seoul Metropolitan Center for Dementia. Of the population registered in the online database, family caregivers for individuals with dementia at home were chosen, and a total of 360 responses were obtained from those who agreed to participate. Excluding questionnaires with missing data, data from 359 primary caregivers were analyzed. Using a structured questionnaire, trained nurses administered face-to-face or telephone interviews. Except for examinations for disease severity, most information, including answers to the CANE tool, was provided by family caregivers. Individuals with dementia were those with a clinical diagnosis of dementia, based on the minimal state examination (MMSE) [15] and Clinical Dementia Rating [16], implemented by expert psychiatrists.

Ethical considerations

Ethical approval was obtained from the institutional review board of Seoul National University Hospital (Approval no. H-1404-075-572). The authors were authorized to access online data resources by the Seoul Metropolitan Center for Dementia.

Instruments

The CANE-K was obtained after completion of the following standard procedures. An adaptation measure ought to show content equivalence, establishing that the domain of items is relevant and appropriate for the culture where the tool was adopted, while maintaining content parity [17]. Linguistic validation was achieved through three steps in the translation process. To adapt the original CANE to the Korean culture, first we had two bilingual specialists (one bilingual nurse and one linguist) translate the original CANE questionnaire into Korean. Second, another pair consisting of a
bilingual nurse and a linguist back-translated the tool into English. Third, an expert panel, consisting of two professors of psychiatry, three professors of gerontology nursing, and two field experts, compared the original CANE with the final back-translated version to evaluate and finalize the content. We had difficulty translating the item “deliberate self-harm” into Korean; hence we provided an additional explanation of suicidal ideation and suicide commitment. Also, the item “Inadvertent self-harm” posed some degree of difficulty in translation, which we explained using negligent accidents. The lowest score on the content validity index was .83, and all items were included.

The tool covers 24 areas of the elders’ needs. Each item is rated as 0 for “no need,” 1 for “met need,” and 2 for “unmet need.” The numbers of each answer (no needs, met needs, and unmet needs) were counted separately to evaluate and state of needs in individual participants. The CANE tool also evaluates whether caregivers are receiving the help required for a particular problem and, last, if the patient was satisfied with the assistance received. In their recent validation study of dementia, Miranda-Castillo et al. [6] had a Cronbach’s α of .93 and concluded that the CANE was suitable for use in dementia caregiving settings.

Because no gold standard measurements exist to assess needs in dementia, we evaluated the concurrent validity of the CANE-K by examining correlations between total scores of each need with other concepts. To measure cognitive impairment, behavioral problems, activities of daily living, and caregiver burden, we selected the Seoul Dementia Care Assessment Packet (SDAP) [18] and the Korean version of the Zarit burden interview (ZBI-K) [19]. Previous authors identified the association between those variables and the number of unmet needs using the CANE [12,20]. Consisting of 26 items, the SDAP measures four domains [cognitive impairment, behavioral problems, activities of daily living (ADL), and instrumental activities of daily living (IADL)] in those with dementia. In addition, the ZBI-K assesses two areas: personal burden and role strain [19]. When these variables are chosen, they indicate a need for greater dependency; an inability to perform ADL and IADL requires proper assistance. Behavioral problems and caregiver burden increased with the severity of cognitive impairment from dementia, explaining the large amount of care needs for those with dementia. The higher number of unmet needs associated with the degree of caregiver burden, thus, might be useful in understanding the severity of the disease by assessing unmet need with specific dimensions that require help.

In SDAP, cognitive impairment consists of four domains, rated on a 3-point scale in which a score of 0 indicates no problem and 3 indicates severe impairment. The maximum score is 12 and higher scores indicated severe deterioration in cognitive function. In the present study, the Cronbach’s α coefficient was .91. Behavioral problems were assessed with six domains (aggressive behavior, wandering, resisting, inappropriate social behavior, nighttime behavior, and delusion), measured using a 3-point scale with a maximum score of 18. A score of 0 indicates no behavioral problem and those with problems nearly every day (6 times and more per week) scored 3. For the sample in the present study, Cronbach α was found to be .96. Korean Activities of Daily Living (K-ADL) [21] examined ADLs in the SDAP. The maximum score was 27, and individuals with more limitations with daily activities received the higher scores. Cronbach α was .71 for the sample used in this study. The Korean Instrumental activities of daily living (K-IADL) [21] evaluated IADLs in SDAP. The maximum score was 21, and individuals with more limitations in IADL received higher scores. Cronbach α coefficient was .85 in the present study. Internal consistency and various forms of validity for K-ADL and K-IADL were confirmed in a Korean population [21].

The degree of caregiver burden was examined using the ZBI-K, which assesses two areas: personal burden and role strain [19]. A total of 22 items were measured on a 4-point scale. A score of 0 indicates no burden, and individuals scored 4 when experiencing burden nearly always; a higher score indicated heavier caregiver burden. Cronbach’s α coefficient was .95 in the present study. Internal consistency and various forms of validity for ZBI-K were confirmed in Korean caregivers [19].

Data analysis

SPSS 21.0 and AMOS 20.0 (IBM Corp., Armonk, NY, USA) were used for statistical data analysis. Probability values less than .05 were considered statistically significant. Three steps were involved in evaluating the CANE-K. The first step was an internal consistency reliability analysis in which Cronbach’s α values of .70 and item-total correlation of .30 were used to verify internal consistency of the measurement. The second step was construct validity analysis using exploratory factor analysis (EFA) and confirmatory factor analyses (CFA). In conducting the EFA, the underlying structure of the CANE was determined in the assessment of need. Then, CFA followed to validate the factor structure derived from the EFA. EFA was performed using the extraction of principal components using varimax rotation to analyze the internal structure of the CANE-K. The number of factors to retain was determined by Eigen values greater than 1, scree models, and parallel analysis. In addition, the item factor loading scores greater than .40 was used to determine factor structure. Before conducting EFA and CFA, the total sample of 359 was divided into two separate subgroups using the random-selection tool in SPSS. The EFA was conducted using the first subsample (n = 179) whereas the second subsample (n = 180) was used for the CFA. For the factor analysis, the sample size had no determined criteria. Tinsley and Tinsley suggested 5–10 ratios per variables [22]. In addition, in the case of less than 40 variables, Comrey suggested a sample size of 200 [23]. Taking these suggestions together, these two smaller subsamples were still adequate to conduct the factor analysis with a 7:5:1 ratio with 24 items. Once a latent variable structure (model) was constructed by EFA, CFA was conducted to evaluate the quality and reliability of the model fit. For the estimation of the model fit, Chi-square statistic, goodness-of-fit index, adjusted goodness-of-fit index, comparative fit index, and root mean square error of approximation were used. The third step was a concurrent validity analysis of the CANE, by performing Pearson’s correlation analysis between the aggregated counts of no needs, met needs, and unmet needs of CANE-K and the scores for cognitive impairment, behavioral problems, ADL, IADL, and caregiver burden.

Results

Sample characteristics

The mean age of individuals with dementia and caregivers was 80.04 [standard deviation (SD) = 7.49] and 64.68 (SD = 12.61), respectively. Two of three people with dementia and caregivers were female, 66.0% and 68.5%, respectively. Primary caregivers were spouses (39.2%), followed by daughters (23.4%) and sons (14.5%). The majority (60.7%) were diagnosed with Alzheimer’s dementia, and the mean MMSE score of individuals with dementia was 15.34 (SD = 5.99). The mean Clinical Dementia Rating score was 2.13 (SD = 0.91), with about one-third (28.2%) having moderate to severe dementia (Table 1).

Internal consistency reliability

Internal consistency was verified with Cronbach’s α coefficients. The corrected item total correlations indicated the extent of correlation between any one item and the remaining items. Field [24]
Based on the outcomes of EFA, the CANE-K (22 items excluding alcohol and drugs) was examined and found to significantly correlate with two items (behavioral problems and IADL). The CANE-K signified 8.4 (Factor 1), .59 (Factor 2), .66 (Factor 3), and .55 (Factor 4). The Cronbach α value of the 22 item CANE-K was .85.

**Confirmatory factor analysis**

Based on the outcomes of EFA, the CANE-K (22 items excluding alcohol and drugs) was examined and the results of the CFA showed goodness-of-fit (Table 3). The output of the model is shown as standardized estimates in Figure 1. All 22 items were loaded on the four latent variables, ranging between .25 and .85 (Table 2).

**Concurrent validity**

Pearson’s correlation coefficient between the CANE-K and other instruments is reported in Table 4. The correlations between “Unmet need” measured with CANE-K and cognitive impairment (r = .49, p < .001), behavioral problem (r = .43, p < .001), ADL (r = .50, p < .001), and caregiver burden (r = .34, p < .001) were measured and found to significantly positively correlate. “No need” on the CANE-K significantly negatively correlated with behavioral problem (r = −.49, p < .001), cognitive impairment (r = −.55, p < .001), ADL (r = −.54, p < .001), IADL (r = −.61, p < .001), and caregiver burden (r = −.41, p < .001). The “Met need” on the CANE-K had a weak but statistically significant correlation with two items (behavioral problems and IADL).
The present study offered primary evidence of the validity and reliability of the CANE-K. Although the CANE has been used internationally to measure the needs of older adults in general, as well as people with dementia, this study was the first attempt to validate the measurement for use in Korea. Overall, the findings from this study, using a large community data set, revealed the CANE-K has potential to be a valuable tool to evaluate the needs of people with dementia from caregivers’ perspectives. The implementation of the CANE-K was favorable, and the instrument was well accepted by study participants. The interview process took no longer than 30 minutes. The Item Alcohol had a significantly low item-total correlation. The low loading for alcohol on other factors in CANE-K suggested that omitting this variable improved the model fit. A previous validation study of the Arabic version of CANE with community-dwelling elderly in Lebanon had the same issue in that alcohol

Table 4 Concurrent Validity of the CANE-K (N = 359).

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Note. CANE-K = 22-item Korean version of Camberwell Assessment of Needs for the Elderly; K-ADL = Korean version of Activities of daily Living; K-IADL = Korean version of Instrumental activities of daily living; SDAP = Seoul Dementia Care Assessment Packet; ZBI-K = Korean version of Zarit Burden Interview.

Discussion

The present study offered primary evidence of the validity and reliability of the CANE-K. Although the CANE has been used internationally to measure the needs of older adults in general, as well as people with dementia, this study was the first attempt to validate the measurement for use in Korea. Overall, the findings from this study, using a large community data set, revealed the CANE-K has potential to be a valuable tool to evaluate the needs of people with dementia from caregivers’ perspectives. The implementation of the CANE-K was favorable, and the instrument was well accepted by study participants. The interview process took no longer than 30 minutes.

The Item Alcohol had a significantly low item-total correlation. The low loading for alcohol on other factors in CANE-K suggested that omitting this variable improved the model fit. A previous validation study of the Arabic version of CANE with community-dwelling elderly in Lebanon had the same issue in that alcohol...
was the last item loaded on a factor alone without other items [27]. In addition, this result could relate to previous studies in Germany and the United Kingdom that identified relatively low need in this area (alcohol) among people with dementia [1,13]. Furthermore, a previous study with older adults with dementia in Korea found low rates of individuals with dementia having problems with alcohol and substance abuse [28]. Alcohol is an important issue for older adults in general; heavy alcohol assumption aligns with development of dementia [29]. However, individuals with dementia may be less likely to have alcohol problems, especially those with higher severity due to their inability to get alcohol themselves.

By using CFA, we found that the structure of the four factors and the factor loading of items was significant for each factor. Factor 1, autonomy need, consisted of seven items; need is defined as needs for basic and instrumental daily activities associated with level of dependency in individuals with dementia. Autonomy refers to identification, which involves independence and rational decision-making. As described in previous research [13], those with dementia experience loss of autonomy when they adapt to the disease process. During this phase, individuals with dementia often give up their independence and consent for decision-making. Factor 2 contained six items of environmental need assessing primarily the living environment of individuals with dementia (e.g., accommodation). In addition, included items were the needs for stability and safe surroundings (e.g., mitigating the possibility of inadvertent and deliberate self-harm). Factor 3 had six items of social need, assessing social support (e.g., benefit and disease treatment), and social-life dimensions (e.g., daytime activity and company). Finally, Factor 4 consisted of three items assessing the attributes of psychological dimensions of dementia (e.g., psychotic symptoms).

Notably, the subscale of Factors 2 (environmental need) and 4 (psychological need) had fairly low Cronbach α, below the recommended value of .70. This may be explained by the nature of the CANE instrument. The characteristics of the item with fairly independent characteristics of each item and response format of the CANE-K with the short width might result in the low Cronbach α reported in this study.

The factor structure obtained in the current study is different from those used and proposed in previous studies [1,12,13]. Although previous studies did not conduct statistical analysis to confirm the structure, this inconsistency may relate to different cultural norms, formal support systems, and the population in this study. Including dementia caregivers, outcomes from this study may reflect particular needs in the dementia population. Consistent with the original CANE, the factor analysis conducted in this study identified four factors; however, some difference emerged in item formation. In autonomy needs, items of continence and mobility were included that belonged to physical needs in the original CANE. Psychological needs consist of similar items except the item eyesight/hearing/communication, which was a physical need in the original version.

The item benefit, which means formal benefits from government or a welfare agency, was categorized as an environmental need in the original version but was a social need in this study, whereas the remaining items in environmental needs were the same. The presence of these discrepancies can be explained by the study population: the original CANE was validated mostly with the general elderly whereas this study included individuals with dementia. Thus, the results of factor analysis may present different constructions of the tools. The disease-specific characteristics of dementia, such as restricted ADLs and neurobehavioral symptoms, may affect the factor structure of the tool. In addition, the previous validation study using the Arabic version [27] derived nine factors, which implied the potential influence of socioenvironmental characteristics. Thus, future research is warranted to confirm the factor structure of the CANE. Each item of the CANE represents its own specific need; therefore, it would be more meaningful to derive a need from each item.

For concurrent validity, the CANE-K significantly aligned with the other tools in this study. Good levels of validity were found in the original CANE (correlated with the behavioral problem scale, \( r = .66 \); and the Barthel ADL, \( r = .53 \)) in a previous study [9]. The total number of “unmet needs” and “no needs” on the CANE demonstrated good concurrent validity with various measures evaluating cognitive impairment, behavioral problems, ADLs, IADLs, and caregiver burden. Dementia disease causes disability with high levels of dependency associated with high levels of needs as well as unmet needs [6]. Negative correlations emerged between the total number of “no needs” on the CANE and the measurements above, which also provided evidence for concurrent validity.

Consistent findings emerged with a previous study by Stein [12] assessing the correlation of the CANE with various tools including ADL, IADL, MMSE, and the Social Support Inventory. The level of cognitive impairment, limitation of activity level, and restricted social support related to “unmet need” on the CANE. Furthermore, in this study, the correlation analysis with other measures may relate to the uniqueness of the concept “needs,” which may not describe an identical meaning comprehensively. Similarly, a previous study of the Dutch version does not find the gold standard in need assessment and found no criterion instruments for some items such as “alcohol” and “benefits.” A previous validation study of the Arabic version of the CANE found similar correlation levels with items of the EuroQol EQ-5D well-being scale (up to \( r = .59 \); e.g., problems in taking care of oneself or performing usual activities). The total number of “met needs” showed relatively low correlation with SDAP and ZBI which proves complexity of “needs” as a concept. “Unmet need” means more than having problems; rather, it indicates no appropriate and adequate help exists to answer needs.

Furthermore, findings from the validation of the CANE-K have important clinical implications. The CANE-K accurately identifies the needs that provide a sound basis of person-centered care planning and creating a care framework for people with dementia. To evaluate one’s suitability for social and medical benefits, the tool used for long-term care insurance in Korea only focused on ADLs, IADLs, cognitive impairment, and neurobehavioral problems. No specific instrument previously existed to measure met needs and unmet needs for people with dementia in Korea; thus, the CANE-K may provide discriminative information. In this sense, the CANE-K may contribute to improved health and wellness of individuals with dementia as well as their caregivers. Caregivers’ lack of awareness and beliefs that services would not be helpful is attributed to high unmet needs [30]. The unmet needs assessment provides pivotal components for effective care delivery [9], and previous studies found good potential for quality care as social care using the CANE [1,12,13]. Areas of unmet need detected by CANE may serve as a signpost to guide health providers and policymakers in addressing important issues in dementia.

This study has several limitations. First, the recruited caregivers of individuals with dementia were those living in urban areas, which limits generalizability. Furthermore, the tool was adapted only for informal caregivers, which may restrict its use for individuals with dementia and professionals working with dementia. Thus, future research with a more diverse population is warranted. In addition, using secondary data analysis, other analysis methods to measure reliability were performed. Despite the limitations, as the first study in Korea, the present study investigated the needs of individuals with dementia by their informal caregivers using a large data set. In addition, the random-sampling method with a healthy
elderly group or other disease groups may enhance the generalizability of the findings from this study.

Conclusion
In this study, an internationally recognized tool for old adults’ need assessment was translated into Korean and evaluated. The CANE-K showed reasonable degree of reliability and validity. An increasing need exists for diverse community services and proper coordination that integrates the needs, especially unmet needs, of those with dementia. Better distribution and use of health services can be feasible with a comprehensive assessment of needs using the CANE-K.

Conflicts of interest
The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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