Original Research Article

Validation Study of the Korean Version of the Brief Clinical Form of the Neuropsychiatric Inventory

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Key Words

Neuropsychiatric Inventory · Neuropsychiatric Inventory Questionnaire · Dementia · Clinical assessment · Validity

Abstract

Aim: This study aims to provide a brief questionnaire form of the Neuropsychiatric Inventory (NPI-Q) in Korean translated from the original NPI-Q that is intended for the evaluation of behavioral and psychological symptoms of dementia in routine clinical practice. **Patients and Methods:** We developed a Korean version of the NPI-Q (KNPI-Q) and compared subitems with those of the Korean version of the NPI (KNPI) in 63 dementia patients; 47 patients had been diagnosed with Alzheimer's disease with dementia, 8 with vascular dementia, and 8 with dementia with Lewy body disease. The diagnosis was based on the National Institute of Neurological and Communicative Disorders and Stroke – Alzheimer's Disease and Related Disorders Association criteria for possible and probable Alzheimer's disease and the *International Statistical Classification of Diseases and Related Health Problems*, 10th revision, criteria for vascular dementia and other dementing diseases. All patients received the Korean version of the Mini-Mental State Examination and the Clinical Dementia Rating within 1 month of the KNPI-Q. **Results:** Test-retest reliability of the KNPI-Q using a Pearson correlation index was r = 0.89 for the total symptom scale and r = 0.90 for the distress scale. The prevalence of analogous symptom ratings differed by less than 6.7%. Convergent validity between the KNPI-Q and the NPI using a Pearson correlation index was r = 0.879 for the total symptom scale and r = 0.92 for the distress scale. **Conclusions:** The KNPI-Q is a reliable and brief instrument that can be employed for screening in the evaluation of neuropsychiatric symptoms of dementia and associated caregiver distress. It may be suitable for use in general clinical practice and could be administered as a brief neuropsychiatric interview.

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Kim et al.: Validation Study of the Korean Version of the Brief Clinical Form of the Neuropsychiatric Inventory

Introduction

Neuropsychiatric disturbances are common manifestations of all kinds of dementing disorders [1]. The neuropsychiatric features of dementias have important diagnostic, prognostic, and management implications [2–4]. Neuropsychiatric symptoms may be the presenting emerging manifestations before cognitive disturbance in dementia patients [3]. Neuropsychiatric symptoms of dementia are distressing to patients and caregivers and often lead to institutionalization [3, 5, 6]. The Neuropsychiatric Inventory (NPI) has been widely used for checking symptoms of neuropsychiatric disturbances [1]; with its proven validity and reliability, the NPI has been translated into many different languages, and its wide acceptance is evidenced by its use in a variety of dementia studies. The NPI assesses a broad range of psychopathologies through interviews with caregivers, who are familiar with patients' behaviors. It encompasses 12 behavioral domains, with each domain consisting of a screening question and 8 or 9 subquestions. Psychiatric symptoms of dementia vary according to the study, population [7], cultural background [8], ethnicity [8], type of disease [9], and severity of dementia [10]. One study reported that behavioral and psychological symptoms of dementia, in order of prevalence, were apathy, depression, irritability, anxiety, and agitation, which were the most common symptoms occurring in very mild to mild Alzheimer's disease patients in Korea [11]. There is a need for methodologically similar and uniform studies of neuropsychological symptoms of dementia using appropriately validated instruments.

The Korean version of the NPI (KNPI) was validated in 2000 by Choi et al. [12]. It is a very delicate method used to assess dementia patients' behaviors and burden. However, when patients have many behavioral and psychological symptoms, the test may take more than 20 min to complete, which is impractical in many clinical settings. Instead, a caregiver-administered NPI, in which caregivers complete the written form of the worksheet of the NPI, has been widely used in clinics [13]. Still, this version also requires a significant time investment to complete.

A brief version of the NPI, the NPI Questionnaire (NPI-Q), has been widely accepted as it saves time in general practice [14]. The NPI-Q has already been validated and is widely used in many countries [15–17]. The original version of the NPI-Q reported that test-retest reliability of the NPI-Q was acceptable and that the prevalence of analogous symptoms reported on the NPI and the NPI-Q differed on average by 5%; moderate or severe symptom ratings differed by less than 2% [14]. The purpose of this study was to evaluate the test-retest reliability and convergent validity of the Korean version of the NPI-Q (KNPI-Q) and to compare it with the psychometric properties of the NPI in a practical setting. We will also discuss the relationship between the KNPI-Q, patients' cognitive profiles and dementia severity. We hypothesized that the KNPI-Q presents psychiatric properties similarly to other language versions.

Subjects and Methods

Participants

In total, 63 patients with dementia participated; 47 had been diagnosed with Alzheimer's disease with dementia, 8 with vascular dementia, and 8 with dementia with Lewy body disease. The diagnosis was based on the National Institute of Neurological and Communicative Disorders and Stroke – Alzheimer's Disease and Related Disorders Association criteria for possible and probable Alzheimer's disease [18] and the *International Statistical Classification of Diseases and Related Health Problems*, 10th revision (ICD-10), criteria for vascular

Kim et al.: Validation Study of the Korean Version of the Brief Clinical Form of the Neuropsychiatric Inventory

dementia and other dementing diseases [19]. Caregivers who provided behavioral information were family members who lived with the patients or relatives who visited the patients more than twice per week.

Translation of the KNPI-Q

The English version was translated into Korean by two Korean neurologists. The translated version went through two review processes, first by the behavioral neurology group and then by the 14 active members of the Korean Dementia Association. Further changes were made after it had been applied to 10 dementia patients. Then, the translated version was translated back to English by a bilingual (a Korean-American) nonmedical person who compared the original NPI-Q and the back-translated English version before deciding on the final KNPI-Q version.

Administration of the KNPI-Q and KNPI

The KNPI-Q worksheet was graphically identical to the original NPI-Q version. Caregivers of the patients were interviewed with the KNPI-Q using the same procedures as reported in the validation report of the original NPI-Q [14]. Written instructions for completing the questionnaire form are included on the first page. Before giving the KNPI-Q worksheet to the caregivers, the examiners illustrated the procedure by offering examples in the delusion domain (presupervision). After the caregivers had completed the KNPI-Q without assistance, they were briefly interviewed by the examiner (postsupervision), a clinician who verified whether the caregivers had completed the form appropriately. We added a new item to the total score of the KNPI-Q, namely summation of severity × distress score, which differed from the original version. In the original version, the authors used a different symptom severity total score (0–36) and a total distress score (0–60). We analyzed the relationship between the total score of the KNPI-Q (0–144) and another set of scores (NPI severity, distress, and total scores).

The NPI was administered so that its results could be compared to the KNPI-Q. The NPI was developed in a way that caregivers could complete the written form of the worksheet of the NPI with interviewer administration [12]. The total score of the NPI was calculated by multiplying the frequency by the severity of each behavioral domain except for the caregiver distress score [12].

The interview with the KNPI-Q was performed first to avoid bias against the KNPI. Test-retest reliability was assessed by asking the caregivers to complete a blank KNPI-Q on the same day when arriving at home. The purpose of the test-retest administration was to examine how consistent the informants' responses would be for the same assessment period (the previous 4 weeks); therefore, a relatively short interval of several hours between administrations was used. The administration of the KNPI-Q preceded the administration of the KNPI by 7.3 ± 1.3 days (range 5–11). The majority (50 of 65) of participants received the tests on the same day. During the period between the administration of the KNPI-Q and the KNPI, drug dosages were not changed for patients prescribed medications for their behavioral symptoms. All patients received the Korean version of the Mini-Mental State Examination (K-MMSE) [20] and the Clinical Dementia Rating (CDR) [21] within 1 month of the KNPI-Q.

Statistical Analysis

The Pearson correlation was applied to examine the test-retest reliability of the KNPI-Q scores. A nonparametric method, the Spearman correlation coefficient, was used to compare the scores of frequency and severity between the KNPI-Q and the KNPI.

Kim et al.: Validation Study of the Korean Version of the Brief Clinical Form of the
Neuropsychiatric Inventory

Table 1. Participants' characteristics

Participants	63
Female/male	45/18
Diagnosis: AD/DLB/VD	47/8/8
Age, years	78.9±6.41 (62–90)
Education, years	4.8±5.16 (0–16)
K-MMSE score	15.61±6.25 (3–27)
CDR score	1.44±0.73
KNPI-Q severity score	9.39±8.36 (0–25)
KNPI-Q distress score	10.14±10.19 (0–37)
KNPI-Q total score	20.5±20.41
KNPI total symptom score	20±24 (0–144)
KNPI distress score	11.52±12.67[a]
KNPI total score	20±24 (0–144)

Values are numbers or means ± standard deviations with ranges in parentheses. AD = Alzheimer's disease; DLB = dementia with Lewy body disease; VD = vascular dementia. [a] Not included in total score.

Statement of Ethics

Confidentiality and anonymity of the participants were assured, and all participants provided informed consent together with their caregiver-informants as part of their evaluation at Hanyang University Medical Center. The study received ethical approval by the Institutional Review Board of Hanyang University Medical Center.

Results

The demographics of patients and caregivers are presented in table 1. The participants consisted of 18 men and 45 women with a mean age of 78.9 ± 6.41 years (range 62–90), a mean education of 4.8 ± 5.16 years (range 0–16), a mean K-MMSE score of 15.61 ± 6.25 (range 3–27), and a mean CDR score of 1.44 ± 0.73 (CDR score = 1 in 39 patients; CDR score = 2 in 17 patients; CDR score = 3 in 7 patients) (table 1). The caregivers included 12 men and 51 women. Their mean age was 54.5 ± 10.9 years (range 32–86), and their mean education was 8.1 ± 5.8 years (range 4–19). The KNPI-Q total symptom score was 9.39 ± 8.36 (range 0–25), and the caregiver distress score was 10.14 ± 10.19 (range 0–37) (table 1).

Test-retest reliability of the KNPI-Q using Pearson's correlation index was r = 0.89 for the total symptom scale and r = 0.905 for the distress scale. The reliability (test-retest correlation) of the total KNPI-Q severity and distress scales was 0.95 and 0.93, respectively (p < 0.001 for both).

The correlations of the subscale scores of each domain between the KNPI-Q and the KNPI are shown in table 2. The total symptom score (frequency × severity score) of the 12 neuropsychiatric domains obtained by the KNPI was compared to the severity scores obtained using the KNPI-Q (table 2). The correlation coefficients showed a fair to good (r = 0.5–0.7) correlation of the severity score in all domains. The highest values were recorded for the delusion and dysphoria/depression items (r = 0.68 and 0.69, respectively) and the lowest value for the euphoria/elation item (r = 0.16). The distress score of the KNPI-Q was strongly correlated with that of the KNPI (table 2). The correlation coefficients for distress were good to high (r = 0.63–0.81). The euphoria/elation and nighttime disturbance items had the lowest values (r = 0.57 and 0.54, respectively). The caregiver distress scores in each subscale of the KNPI-Q correlated significantly with those of the KNPI (all r > 0.54, p < 0.001; table 2). The KNPI-Q total scores were well correlated with the KNPI total symptom scores (all r > 0.58,

Kim et al.: Validation Study of the Korean Version of the Brief Clinical Form of the
Neuropsychiatric Inventory

Table 2. Interscale correlation between the KNPI-Q and the KNPI

Variables	KNPI-Q severity vs. KNPI total symptom score	KNPI-Q distress vs. KNPI distress	KNPI-Q total vs. KNPI distress	KNPI-Q total vs. KNPI total score
Delusion	0.68*	0.76*	0.65*	0.59*
Hallucination	0.53*	0.73*	0.37*	0.30*
Agitation/aggression	0.52*	0.79*	0.72*	0.75*
Dysphoria/depression	0.69*	0.68*	0.70*	0.72*
Anxiety	0.64*	0.73*	0.65*	0.71*
Euphoria/elation	0.16 (p = 0.19)	0.57*	0.32*	0.40*
Apathy/indifference	0.58*	0.63*	0.59*	0.61*
Disinhibition	0.64*	0.81*	0.60*	0.59*
Irritability/lability	0.62*	0.80*	0.63*	0.67*
Aberrant motor behavior	0.66*	0.80*	0.68*	0.68*
Nighttime disturbance	0.50*	0.54*	0.64*	0.63*
Appetite/eating disturbance	0.51*	0.67*	0.56*	0.56*

* $p < 0.0001$, Spearman correlation coefficient.

$p < 0.001$; table 2) except for the hallucination and euphoria/elation items ($r = 0.30$ and 0.40, respectively, $p < 0.001$; table 2).

To evaluate the usefulness of the KNPI-Q, we compared the symptom scores between the two scales according to the severity of dementia as reported in the original version of the NPI-Q [14]. Fifty percent or more of all subjects had reported on both scales to have symptoms of apathy/indifference, dysphoria/depression, irritability/lability, and agitation. Hallucinations, euphoria/elation, and appetite/eating disturbance were reported on both scales by less than or about 20% of subjects (table 3). More patient symptoms were reported on the KNPI-Q (compared to the KNPI). Almost all domains were reported as 3.1–9.5% more prevalent on the KNPI-Q than on the KNPI except for agitation/aggression. Agitation/aggression was more prevalent on the KNPI than on the KNPI-Q. The prevalence of delusion, hallucination, anxiety, agitation/aggression, disinhibition, and appetite/eating disturbance differed by ≤5% across the two scales. Euphoria/elation and nighttime disturbances differed in prevalence on the KNPI and KNPI-Q (table 3). Overall, the average difference between the two scales for reporting a given symptom was 6.0% (mean absolute difference). The mean relative difference, reflecting the net difference in reported symptom prevalence, was 3.8%, with a higher mean for the KNPI-Q than for the KNPI. Moderate to severe delusion, agitation/aggression, disinhibition, and appetite/eating disturbance were reported to be more prevalent on the KNPI, whereas moderate to severe hallucination, dysphoria/depression, apathy/indifference, irritability/lability, aberrant motor behaviors, and nighttime disturbances were more commonly reported on the KNPI-Q (table 3). Moderate to severe appetite/eating disturbance was more prevalent on the KNPI (by 4.7%). The mean absolute difference between the KNPI and the KNPI-Q in moderate to severe symptoms was 2 (3.1%).

The correlation coefficient between the KNPI-Q total score and the KNPI was 0.98 regardless of the participants' K-MMSE score (table 4). When the participants were divided according to their K-MMSE score, the higher K-MMSE group had a better correlation between the KNPI-Q and the KNPI. In the high K-MMSE group, the KNPI-Q severity score presented a significant inverse correlation with the K-MMSE score (table 4). This trend was not observed in the low K-MMSE group. The correlation coefficient of the KNPI-Q and KNPI total scores was 0.98 regardless of the CDR score (table 5). When the participants were divided according to the CDR score, the KNPI-Q score did not show any significant correlation with the CDR score (table 5).

Table 3. Comparison of individual symptoms between the KNPI and the KNPI-Q (n = 63)

| | Subjects with symptoms, n (%) | | | | | |
	KNPI	KNPI-Q	Difference between KNPI-Q and KNPI[a]	KNPI moderate to severe	KNPI-Q moderate to severe	Difference between KNPI-Q and KNPI[b]
Delusion	21 (33)	24 (38)	+3 (4.7)	14 (22)	13 (20)	−1 (−1.5)
Hallucination	13 (20)	16 (25)	+3 (4.7)	9 (14)	10 (15)	+1 (1.5)
Agitation/aggression	34 (53)	32 (50)	−2 (−3.1)	18 (28)	17 (27)	−1 (−1.5)
Dysphoria/depression	34 (53)	38 (60)	+4 (6.3)	20 (25)	22 (34)	+2 (3.1)
Anxiety	28 (44)	30 (48)	+6 (9.5)	20 (23)	20 (31)	0 (0.0)
Euphoria/elation	10 (16)	15 (24)	+5 (8.0)	4 (6.3)	5 (7.9)	+1 (1.5)
Apathy/indifference	29 (46)	33 (52)	+4 (6.3)	21 (33)	22 (34)	+1 (1.5)
Disinhibition	25 (40)	27 (43)	+2 (3.1)	18 (28)	16 (24)	−2 (−3.1)
Irritability/lability	28 (44)	32 (50)	+4 (6.3)	20 (31)	21 (33)	+1 (1.5)
Aberrant motor	23 (37)	27 (43)	+4 (6.3)	20 (31)	21 (33)	+1 (1.5)
Nighttime disturbance	19 (30)	29 (46)	+10 (15.8)	19 (25)	21 (33)	+2 (3.1)
Appetite/eating disturbance	21 (33)	24 (38)	+3 (4.7)	16 (25)	13 (20)	−3 (−4.7)

[a] The mean absolute difference reflects the average difference between the scales in the number of reported symptoms for each domain. [b] Refers to symptom severity rating of either 2 (moderate) or 3 (severe).

Table 4. Interscale correlation between the KNPI-Q and the KNPI according to the K-MMSE

Variables	High K-MMSE (>17) (n = 24)	Low K-MMSE (≤17) (n = 39)
KNPI-Q severity vs. KNPI total score	0.99*	0.80*
KNPI-Q distress vs. KNPI total score	0.87*	0.85*
KNPI-Q total vs. KNPI total score	0.98*	0.85*
KNPI-Q severity vs. K-MMSE	−0.45 (p = 0.03)	−0.12 (p > 0.05)
KNPI-Q distress vs. K-MMSE	−0.18 (p > 0.05)	0.05 (p > 0.05)
KNPI-Q total score vs. K-MMSE	0.18 (p > 0.05)	0.08 (p > 0.05)

* $p < 0.0001$, Spearman correlation coefficient.

Table 5. Interscale correlation between the KNPI-Q and the KNPI according to the CDR

Variables	All (n = 63)	High CDR (>1) (n = 25)	Low CDR (≤1) (n = 38)
KNPI-Q total vs. KNPI total score	0.98*	0.98*	0.99*
KNPI-Q distress vs. KNPI distress	0.77*	0.75*	0.80*
KNPI-Q severity vs. KNPI total symptom score	0.99*	0.99*	0.99*
KNPI-Q total vs. CDR	0.19 (p = 0.12)	0.10 (p = 0.54)	0.03 (p = 0.98)
KNPI-Q severity vs. CDR	0.22 (p = 0.08)	−0.21 (p = 0.25)	0.33 (p = 0.04)
KNPI-Q distress vs. CDR	0.14 (p = 0.25)	0.29 (p = 0.09)	0.03 (p > 0.05)

* $p < 0.0001$, Spearman correlation coefficient.

Kim et al.: Validation Study of the Korean Version of the Brief Clinical Form of the Neuropsychiatric Inventory

Discussion

The KNPI-Q proved in many ways to be a very reliable and robust scale that required only a short time to complete; the mean time for completion was just 5 min. The reliability measures assessed in this study were also impressive. This study offers evidence that the KNPI-Q had adequate test-retest reliability and good correlation with the full version of the KNPI, especially with respect to the moderate to severe stage. This is a result similar to that of the original version of the NPI-Q [14].

The KNPI-Q differs from the KNPI in some aspects. It is given as a two-page self-administered questionnaire and consists of symptom severity and caregiver distress ratings. The total score of the KNPI-Q is the result of the severity score multiplied by the caregiver distress scores. Compared with the KNPI, the results were statistically significant and correlated in each domain. In this study, the administration of the KNPI took a mean of 20 min. The KNPI was reported to take 20–30 min in a previous study [12]. This result suggests that the KNPI-Q might be a good substitute for the KNPI or other tools since it can be completed by clinicians in a short period of time.

The clinical validity of the scale must be considered sufficient. Most of the items of the KNPI-Q were highly correlated with items of the KNPI. However, the euphoria/elation items did not show a significant correlation with the original version on both the severity and distress scales. This finding might be due to difficulties in translating the definition of the item of euphoria/elation into Korean using a short sentence. A previous study about the neuropsychiatric symptoms of Korean dementia patients showed a low prevalence of euphoria/elation [11, 22]. In the original version of the NPI, euphoria/elation were the least prevalent neuropsychiatric symptoms of dementia [1]. However, the severity scores were similar on the moderate to severe euphoria/elation item. That means it would be difficult to clarify this special symptom for caregivers of patients in a mild stage of dementia. Only a few participants reported that they experienced this problem in our study; this small number of answers could have influenced the statistically insignificant result of the correlation coefficient between the KNPI-Q and the KNPI. One other reason could be that caregivers might have different views and responses concerning the neuropsychiatric symptoms of dementia due to their race, culture, and ethnicity [23].

When the KNPI-Q was analyzed after dividing the group according to the K-MMSE scores, it showed a good correlation with the KNPI in both groups. Only the severity score of the KNPI-Q was correlated with the K-MMSE in the high K-MMSE group; however, the total and the distress scores did not show a significant relation with the K-MMSE. When compared to the CDR score, there was also no correlation between the KNPI-Q and the CDR score. This finding is likely due to the diversity of the participants' diseases.

Conclusions

The KNPI-Q demonstrated an excellent correlation with the original KNPI and could be a good substitute in the clinic when only very short periods of time for evaluation are available. Therefore, the KNPI-Q can be used in clinical practice or research settings as a comprehensive, practical, reliable, and brief instrument to measure neuropsychiatric symptoms in patients with dementia and to assess the related emotional burden of primary caregivers.

Disclosure Statement

The authors have no conflicts of interest to declare.

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