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The reliability and validity of the Turkish version of the Neuropsychiatric Inventory-Clinician

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Background/aim: The Neuropsychiatric Inventory-Clinician (NPI-C) scale is one of the best-known scales for evaluating the behavioral and psychological symptoms of dementia. This study aimed to assess the reliability and validity of the Turkish version of the NPI-C scale in patients with Alzheimer disease (AD).

Materials and methods: The NPI-C scale was administered to 125 patients with AD. For reliability, both Cronbach's α and interrater reliability were analyzed. The Behavioral Pathology in Alzheimer's Disease (BEHAVE-AD) scale was applied for validity and, in addition, the Mini Mental State Examination (MMSE), Instrumental Activities of Daily Living (IADL) scale, and Disability Assessment of Dementia (DAD) scale were completed.

Results: The Turkish version of the NPI-C scale showed high internal consistency (Cronbach's α = 0.75) and mostly good interrater reliability. Assessments of validity showed that the NPI-C and corresponding BEHAVE-AD domains were found to be significantly correlated, between 0.925 and 0.195. Moreover, the correlations between NPI-C and MMSE were significant for all domains except the dysphoria, anxiety, and elation/euphoria domains. When we conducted a correlation analysis of NPI-C with IADL, all domains were statistically significantly correlated except aggression, anxiety, elation/euphoria, and dysphoria.

Conclusion: The Turkish version of the NPI-C scale was found to be a reliable and valid instrument to assess neuropsychiatric symptoms in Turkish elderly subjects with AD.

Key words: Alzheimer disease, neuropsychiatric symptoms, Neuropsychiatric Inventory-Clinician

1. Introduction

Alzheimer disease (AD) is a progressively neurodegenerative disease that is characterized by cognitive and memory impairment, progressive deterioration in the maintenance of daily living activities, and neuropsychiatric and behavioral symptoms. Behavioral and psychological symptoms of dementia (BPSDs) are the most burdensome symptoms of the disease. These symptoms lower the quality of life of both patients and their caregivers, leading to an increase in placement in nursing homes. BPSDs are associated with generally higher healthcare costs (1–3). Characterizing and quantifying these symptoms is especially important for the effectiveness of pharmacological and nonpharmacological therapies.

There have been many scales developed to measure the neuropsychiatric symptoms of dementia. These scales can be classified based on whether they measure the dimensions, severity, or frequency of BPSDs and according to the subjects to whom they are applied (patient or caregiver). The most frequently applied instruments for measuring BPSDs are the Behavioral Pathology in Alzheimer's Disease (BEHAVE-AD) scale (4), the Behavioral Rating Scale for Dementia of the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) (5), the Cornell Scale for Depression in Dementia (Cornell SDD) (6), the Geriatric Depression Scale (7), the Cohen–Mansfield Agitation Inventory (CMAI) (8), and the Neuropsychiatric Inventory (NPI) (9).

The NPI, which originally included only 10 items, was originally developed by Cummings et al. for assessing behavioral changes after head trauma (9). In 1997, an updated NPI with 2 new criteria was introduced in order to assess psychopathology in dementia patients (10). Different versions of the NPI were later developed: Neuropsychiatric

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Inventory-Distress (NPI-D) for measuring caregiver burden (11), the Neuropsychiatric Inventory-Nursing Home Version (NPI-NH) for institutionalized dementia patients (12), and the Neuropsychiatric Inventory-Questionnaire (NPI-Q), a shorter version for use in general clinical practice (13). The NPI was translated and validated for use in many different languages and cultures, and it has thus become the most commonly used assessment tool for measuring BPSDs in patients with AD (14–17) and frontotemporal dementia (18).

The assessment of behavioral and psychological symptoms of dementia could be susceptible to bias, especially when getting information from caregivers who are exhausted, depressed, or not educated (19). The cultural beliefs of caregivers about the elderly is also an obstacle for differentiating among neuropsychiatric symptoms. Therefore, the judgement of the clinician based on all data provided by patients and caregivers could be very valuable in determining the appropriate symptoms of BPSDs. The NPI-Clinician (NPI-C), the most recent NPI version, was developed to overcome these limitations (19). The clinician's impressions and neuropsychiatric examination of the patient, along with the caregiver's impressions, are essential for the NPI-C.

In this study, the primary aim was to evaluate the validity and reliability of the Turkish version of the NPI-C, and the second aim was assessing the correlation of the NPI-C with the Disability Scale of Dementia (DAD).

2. Materials and methods

2.1. Participants

We recruited 125 patients, along with their caregivers, from the Geriatric Psychiatry Unit of the Ankara Oncology Research and Training Hospital.

The exclusion criteria for the patients were severe physical disabilities such as paraplegia or hemiplegia, which could increase caregiver burden. The caregivers had to be in verbal contact with the patient at least 3 times per week during the 3 months preceding the study and had to be over 18 years of age. The exclusion criteria for the caregivers were illiteracy; psychiatric disorders such as schizophrenia, psychotic disorders, and dementia; having a score of 17 or above on the Beck Depression Scale; and not consenting to the study.

A written consent form was obtained from all caregivers and from those patients who were able to consent. The study protocol was approved by the Ethics Committee of the Ankara Oncology Research and Training Hospital with approval number 2012-7/3 and date of 03.10.2012.

2.2. Procedures

Patients were all community-dwelling subjects diagnosed with dementia due to AD according to the National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association (NINCDS-ADRDA) criteria. The diagnostic procedure involved a detailed medical history, physical and neurological examinations, laboratory testing and, in most cases, magnetic resonance imaging.

The MMSE was used to measure the cognitive state of the patients (20). The Global Deterioration Scale (GDS) (21) was applied to the patients to assess the severity of their dementia. The Lawton–Brody Instrumental Activities of Daily Living Scale (Lawton–Brody IADL) (22) and the DAD (23) were used to evaluate daily activities and patient disability. In addition to the NPI-C, BEHAVE-AD was also applied to assess the neuropsychiatric symptoms of AD patients.

2.2.1. NPI-C

The NPI-C was revised from the original NPI and includes an additional 78 items, split domains for agitation and aggression, and an extra domain for 'abnormal vocalization'. The most important modification of the NPI-C is the addition of clinician judgement to rate the severity of each item. A reliability and validity study of the NPI-C was published by De Medeiros et al. (19). The validity and reliability of the NPI-C in different cultural settings, such as Brazil, have been examined (24), and work concerning the clinician/caregiver difference in rating BPSDs using the NPI-C has been recently published (25).

For the validity and reliability study of the Turkish version of the NPI-C, it was first translated into Turkish by 2 researchers, then a bilingual Turkish individual who was unfamiliar with the original questionnaire translated the Turkish version back into English. The final version of the NPI-C was compared with the original one. Finally, the NPI-C was applied to 125 patients and their caregivers.

2.3. Statistical analysis

SPSS was used to conduct statistical analysis. The sociodemographic and clinical characteristics of the sample were analyzed by descriptive statistical analysis.

2.3.1. Reliability

For the reliability of the Turkish version of the NPI-C, Cronbach's alpha correlation coefficient and interrater reliability were assessed. An internal consistency of 0.70 was sought for all domains of the NPI-C, as recommended for Cronbach's alpha correlation coefficient (26).

For the interrater reliability, all the patient-caregiver dyads were interviewed by 2 independent raters on the same day. The intraclass correlations and confidence intervals (95% confidence intervals) of raters were analyzed.

2.3.2. Validity

The convergent validity of the NPI-C was analyzed by calculating Pearson's correlations of NPI-C domains with BEHAVE-AD. For divergent validity, the correlations of

NPI-C with MMSE, DAD, Katz ADL, and Lawton IADL were analyzed. $P < 0.05$ was adapted as the criterion for significance.

3. Results

3.1. Sociodemographic and clinical patient characteristics

The patients in the study were mostly female (71.2%, n = 89) and widowed (54.4%), with a mean age of 76.4 ± 1.2 (min–max = 62–101) years. The median estimated duration of AD among patients was 36 (min–max = 12–240) months. According to the GDS, most of the patients were at stage 4 (45.6%) and 5 (27.2%) of AD. The sociodemographic and clinical features of the patients are shown in Table 1.

The mean scores and standard deviations of the MMSE and IADL scales of patients were 16.6 ± 6.4 and 4.5 ± 4.1, respectively. The median scores and min–max scores of the DAD and BEHAVE-AD scales were 31 (0–51) and 6 (0–43), respectively.

3.2. Sociodemographic characteristics of the caregivers

The mean age of the caregivers was 49.7 ± 1.1 years. Caregivers were mostly married (76%) women (66.4%), with a large percentage who were the daughters of patients (37.6%); 74.4% of caregivers were living with their patient. The median caregiving duration per day was 3 h, and the median caregiving duration per month was 24 days (Table 2).

3.3. Internal consistency reliability

The internal consistency of the NPI-C was high, with a Cronbach's alpha of 0.75.

3.4. Interrater reliability

The interrater reliability of NPI-C domains were between 0.99 and 0.31 (Table 3). The apathy/indifference and disinhibition domains had the highest scores of interrater reliability, with 0.99. Because aggression and elation/euphoria symptoms did not appear in the 30 patients that were examined by 2 raters, these domains are not included in Table 3.

3.5. Convergent validity

Table 4 presents the correlation coefficients for the NPI-C with the corresponding subscales and questions of BEHAVE-AD and the entire BEHAVE-AD. The correlation coefficients of NPI-C with BEHAVE-AD were also analyzed according to the stages of the GDS (Table 5).

Table 1. The sociodemographic and clinical characteristics of patients diagnosed with AD.

Variables	Patients (n = 125)
Age, years, mean ± SD (range)	76.4 ± 1.2 (62–101)
Sex, n (%)	
Male	36 (28.8%)
Female	89 (71.2%)
Education, n (%)	
Illiterate	56 (44.8%)
Primary/secondary school	97 (63.2%)
High school	4 (3.2%)
University	4 (3.2%)
Marital status, n (%)	
Married	49 (39.2%)
Widowed/divorced	68 (54.4%)
Estimated duration of illness	
Months, median (range)	36 (12–240)
GDS, n (%)	
Stage 4	57 (45.6%)
Stage 5	34 (27.2%)
Stage 6	24 (19.2%)
Stage 7	7 (5.6%)

SD = Standard deviation, GDS = Global Deterioration Scale.

Table 2. Caregivers' sociodemographic characteristics.

Variables	Caregivers (n = 125)
Age, years, mean ± SD (range)	49.7 ± 1.1 (26–79)
Sex, n (%)	
Male	40 (32.6%)
Female	83 (66.4%)
Relationship to patient, n (%)	
Daughter	47 (37.6%)
Son	32 (25.6%)
Spouse	14 (11.2%)
Daughter-in-law/son-in-law	21 (16.8%)
Other	8 (6.4%)
Residence	
Home	93 (74.4%)
Elderly residence	30 (24%)
Total caregiving days per month	
Median (range)	24 days (1–364)
Duration of daily caregiving, in hours	
Median (range)	3 h/day (1–24)

SD = Standard deviation.

Table 3. Interrater reliability with 95% confidence limits for NPI-C domains.

Domain	ICC (95% CI)
Delusions	0.83 (0.634–0.917)
Hallucinations	0.85 (0.685–0.929)
Agitation	0.97 (0.928–0.984)
Dysphoria	0.97 (0.929–0.984)
Anxiety	0.98 (0.958–0.990)
Apathy/Indifference	0.99 (0.979–0.995)
Disinhibition	0.99 (0.976–0.995)
Irritability/Lability	0.94 (0.876–0.972)
Aberrant motor behavior	0.31 (–0.460 to 0.669)
Sleep disorders	0.85 (0.689–0.930)
Appetite and eating disorders	0.78 (0.527–0.893)
Aberrant vocalizations	0.34 (–0.391 to 0.685)

ICC = Intraclass correlation, CI = confidence interval, NPI-C = Neuropsychiatric Inventory-Clinician.

Table 4. Correlation coefficients between NPI-C domains, corresponding BEHAVE-AD subscales, and overall BEHAVE-AD.

NPI-C domains/BEHAVE-AD subscale /BEHAVE-AD total	Pearson's correlation
NPI-C Delusions/Paranoid and delusional ideation	0.925**
/BEHAVE-AD total	0.841**
NPI-C Hallucinations/Hallucinations	0.899**
/BEHAVE-AD total	0.783**
NPI-C Agitation/Aggressiveness	0.524**
/BEHAVE-AD total	0.561**
NPI-C Dysphoria/Affective disturbance	0.782**
/BEHAVE-AD total	0.312**
NPI-C Anxiety/Anxieties and phobias	0.429**
/BEHAVE-AD total	0.202**
NPI-C Disinhibition/Activity disturbances (15th question)	0.382**
/BEHAVE-AD total	0.463**
NPI-C Irritability-lability/Activity disturbances (14th question)	0.195**
/BEHAVE-AD total	0.420**
NPI-C Aberrant motor behavior/Activity disturbances	0.762**
/BEHAVE-AD total	0.660**
Sleep disorders/Diurnal rhythm disorders	0.821**
/BEHAVE-AD total	0.476**
Aberrant vocalizations/Aggressiveness (16th question)	0.469**
/BEHAVE-AD total	0.631**

**P < 0.01.

Table 5. Correlation coefficients between NPI-C domains and corresponding BEHAVE-AD subscales according to the GDS stages.

NPI-C Domains/BEHAVE-AD subscale	GDS stage 4, r	GDS stage 5, r	GDS stages 6–7, r
NPI-C Delusions/Paranoid, delusional ideation	–0.027	0.815**	0.881**
NPI-C Hallucinations/Hallucinations	0.950**	0.874**	0.834**
NPI-C Agitation/Aggressiveness	–0.224	0.465**	0.560**
NPI-C Dysphoria/Affective disturbance	0.829**	0.806**	0.775**
NPI-C Anxiety/Anxieties and phobias	0.699**	0.350*	0.181
NPI-C Disinhibition/Activity disturbances (15th question)	0	0.229	0.151
NPI-C Irritability-lability/Activity disturbances (14th question)	0.1	0.036	0.086
NPI-C Aberrant motor behavior/Activity disturbances	0.298*	0.603**	0.719**
NPI-C Sleep disorders/Diurnal rhythm disorders	0.784**	0.797**	0.850**
Aberrant vocalizations/Aggressiveness (16th question)	0.427**	0.309	0.452**

*P < 0.05, **P < 0.01

3.6. Divergent validity

3.6.1. Correlation analysis of NPI-C with MMSE and IADL

The correlations between NPI-C and MMSE were significant for all domains except the dysphoria, anxiety, and elation/euphoria domains. When we conducted the correlation analysis of NPI-C with IADL, all domains were statistically significantly correlated except aggression, anxiety, elation/euphoria, and dysphoria.

3.6.2. Correlation Analysis of NPI-C with DAD

The correlations between most of the NPI-C domains and the entire DAD were significant, although Pearson's coefficients were between 0.65 and 0.20. Additionally, the dysphoria and sleep disorders domains of the NPI-C were not significantly correlated with DAD.

4. Discussion

In this study, we analyzed the internal consistency reliability, interrater reliability, and concurrent validity of the Turkish version of the NPI-C.

The Turkish version of the NPI-C has good internal consistency, with a Cronbach's alpha of 0.75. The interrater reliability was perfect for some domains, such as disinhibition, apathy/indifference, and anxiety. Some domains, such as aberrant vocalization and aberrant motor behaviors, however, had low intraclass correlations of between 0.31 and 0.34. In the study of the Brazilian version of the NPI-C (24), the intraclass correlations were between 0.947 and 0.812, which could be interpreted as strong interrater reliability for all domains of the NPI-C. The interrater reliability results, though, were generally moderate to strong in the original NPI-C study and the strongest intraclass correlations emerged in the hallucinations and sleep disturbance domains.

For the validity of the Turkish version of the NPI-C, delusions, hallucinations, and sleep disorders had the highest correlation coefficients with the corresponding subscales and items of BEHAVE-AD, at 0.925, 0.899, and 0.821 respectively. The weakest correlation was in the irritability/lability domain (0.195) of the NPI-C. When total convergent validity with BEHAVE-AD was analyzed, the delusion domain again had the highest and anxiety the lowest correlation coefficients (0.841 and 0.202). In the original NPI-C study, the weakest correlation was for apathy (r = 0.31) and the strongest was for dysphoria domain (r = 0.61). In the Brazilian version, apathy had the strongest correlation and hallucinations had the weakest, which may be attributed to the scales used. In the Brazilian study, BPSD, which is a scale developed for assessing changes in the psychotic and depressive symptoms in any kind of psychiatric disorder during pharmacological treatment, had been used to assess hallucinations (27).

The strength of the correlation between NPI-C and BEHAVE-AD changed at the different stages of GDS. The correlations of disinhibition and irritability/lability were not significant at any stage of GDS. In the Brazilian NPI-C study, hallucinations and aberrant vocalizations were not correlated with related scales at any severity stage (24); however, in the Turkish version, hallucinations, dysphoria, and sleep disorders domains were strongly correlated

with the corresponding subscales of BEHAVE-AD. The difference between the 2 studies may depend on the different scales used for analyzing correlations.

The correlations between most of the NPI-C domains and the total DAD scores were significant, although Pearson's coefficients were between 0.65 and 0.20. Additionally, the dysphoria and sleep disorders domains of the NPI-C were not significantly correlated with DAD.

There were some limitations to the study: the participants were mostly younger, and most patients were diagnosed at stage 4 (45.6%) or 5 (27.2%) of AD. Patients in the more advanced stages were not as well represented. Furthermore, interrater reliability for the aggression and elation/euphoria domains could not be analyzed because patients included in the study did show any symptoms of aggression or elation/euphoria. Moreover, the potential to apply the results of this study to all types of dementia or to patients in different settings, such as nursing homes, is limited.

The NPI-C is advantageous because it includes detailed questions and clinicians' ratings. Clinician-caregiver correlations for the NPI-C total severity ratings were high (for example, 0.77), which indicates that clinical judgement may be as reliable as caregivers' ratings (25). The revised, expanded, and clinician-rating version of the NPI seems to be a sensitive measurement of the behavioral and psychological symptoms of dementia. This study shows that the Turkish-language version of the NPI-C is a reliable and valid scale for patients diagnosed with AD.

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