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Validity and Reliability of the Turkish Version of Needs Based Biopsychosocial Distress Instrument for Cancer Patients (CANDI)

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Abstract

Background: Needs based biopsychosocial distress instrument for cancer patients (CANDI) is a scale based on needs arising due to the effects of cancer.
Objectives: The aim of this research was to determine the reliability and validity of the CANDI scale in the Turkish language.
Patients and Methods: The study was performed with the participation of 172 cancer patients aged 18 and over. Factor analysis (principal components analysis) was used to assess construct validity. Criterion validities were tested by computing Spearman correlation between CANDI and hospital anxiety depression scale (HADS), and brief symptom inventory (BSI) (convergent validity) and quality of life scales (FACT-G) (divergent validity). Test-retest reliabilities and internal consistencies were measured with intraclass correlation (ICC) and Cronbach-α.
Results: A three-factor solution (emotional, physical and social) was found with factor analysis. Internal reliability (α = 0.94) and test-retest reliability (ICC = 0.87) were significantly high. Correlations between CANDI and HADS (rs = 0.67), and BSI (rs = 0.69) and FACT-G (rs = -0.76) were moderate and significant in the expected direction.
Conclusions: CANDI is a valid and reliable scale in cancer patients with a three-factor structure (emotional, physical and social) in the Turkish language.

Keywords: Cancer, Psychological Stress, Need, Validity, Reliability

1. Background

Cancer patients are affected psychologically due to the effects of both the disease and the treatment received. Anxiety and depression are most commonly observed (1). The disease itself influences the life of the patients as well as their families. While the patients try to cope with disease-related physical, emotional, social and economic problems, many different needs arise, which lead to distress (2, 3). In consequence, this outcome in cancer patients is therefore regarded as a biopsychosocial distress. The biopsychosocial distress that emerges is described as an emotional state that troubles the patient and has behavioral, emotional, social, physical, psychological and economic components. A global approach toward cancer patients involving these different fields and specialties is regarded as more beneficial (4). The most important issue is the identification of problems and needs in the early diagnostic period and the provision of professional assistance (5).

Many studies have investigated the anxiety, depression, lower quality of life and psychosocial distress that occur in cancer patients (6-9). Differently, Lowery et al. (4) developed the needs based biopsychosocial distress instrument for cancer patients (CANDI), which is a scale based on needs arising due to the effects of the disease, depending on a global approach. Being based on needs, they aimed to address different facets of having cancer that are apparently experienced by the patients throughout the phases of cancer. This scale differs from other scales in being directly concerned with daily life and involving a problem-focused approach. In terms of its structural characteristics, it is intended to address the entire biopsychosocial field and to do this on the basis of emotional, physical, social and economic needs arising in patients' lives. Another advantage is that it can be applied under clinical conditions.

2. Objectives

The purpose of this research was to determine the reliability and validity of the CANDI scale in Turkish and to

assess its usability in Turkish-speaking cancer patients.

3. Patients and Methods

3.1. Ethical Considerations

This methodological research was carried out between January and April, 2014, at the Karadeniz technical university (KTU) medical faculty oncology clinic chemotherapy unit. The research was approved by the KTU medical faculty clinical research ethical committee (2013/120-677).

3.2. Participants

The research was performed with the participation of patients aged 18 or over, receiving chemotherapy on an outpatient basis and physically and psychologically healthy enough to understand and complete the consent form. The participants were chosen from voluntary patients. The research sample was computed using the G*Power 3.1.5 program with alpha = 0.05, power = 95% and effect size = 0.25 with the participation of at least 200 cancer patients, and was eventually completed with the participation of 201 patients (10). The patients who had unanswered questions in the CANDI were excluded (n = 29).

3.3. Measures

The CANDI scale consists of five subscales emotional state (anxiety and depression subscales), social state, physical condition, health care and practical life and is based on 39 questions completed by patients marking the options most appropriate to themselves. These subscales were formed conceptually. The scale was drawn up by Lowery et al. (4), and its validity and reliability in American society have been confirmed.

3.4. Scoring

Item scores were summed to create a total CANDI score (4). All of the patients who had responses of "Prefer not to answer" and "Do not know" were excluded from the study (n = 29). Subscales for depression (four items) and anxiety (two items) were calculated in the same way.

The hospital anxiety depression scale (HADS) and brief symptom inventory (BSI) were used to determine convergent validity, and the Fact-G scale was used to determine divergent validity.

HADS was developed by Zigmond et al., consists of 14 questions and is used to measure anxiety and depression. The validity and reliability of the Turkish-language version were established by Aydemir et al. (11-12). Cut-off points of 11 and 8, respectively, were used for anxiety and depression. The BSI was developed by Derogatis et al. It consists of 53 validated Turkish-language questions and is used to scan general psychopathological symptoms (13, 14). Fact-G is a quality of life scale previously used in cancer patients and in the Turkish language (15, 16).

3.5. Procedures

Permission to investigate the validity and reliability of the scale was obtained by e-mail from its author, Lowery (4). The scale was translated into Turkish separately by two researchers; one is a psychiatrist and the other is a public health specialist. The final version was produced by comparing the two translations. The scale was then applied as a pilot study in the oncology polyclinic, and minor modifications were made. The parts of the final version that were modified were translated back into English and sent to the author of the scale. The scale was subsequently applied to the patients who agreed to participate in the research over four months in the chemotherapy unit. It was again applied to the first 50 of these volunteers at a subsequent presentation.

3.6. Statistical analysis

3.6.1. Reliability

Intraclass correlation (ICC) was applied to determine test-retest reliability. The Cronbach alpha test was performed to test both the CANDI and the internal reliability of other tests.

3.6.2. Convergent-Divergent Validity

Spearman's correlation test was applied to measure interactions between CANDI and HADS, and BSE (convergent validity) and FACT-G (divergent validity).

3.6.3. Factor Analysis

Factor analysis was performed to test structural validity. Principal component analysis was applied as a factor analysis. Scale compatibility with the factor analysis was assessed using the Kaiser-Meyer-Olkin test and Bartlett's sphericity test. Communality values were assessed in order to test integrity in the scale factor structure. Contributions to variance of explained factors were considered during the determination of the scale factor structure. The scree plot was also evaluated. Once the final form of the factor structure had been established, the factor structure was determined by considering the rotated structure matrix. In addition, ROC analysis was performed to determine cut-off points for anxiety and depression subscales, as in the validation of the original scale. At ROC analysis application, a comparison was performed based on HADS scores and on whether or not the participant wished to discuss a problem with the staff.

Statistical analysis was performed on SPSS 13.0 software. Descriptive statistics were given as mean, standard deviation, median and maximum-minimum values.

4. Results

4.1. Sample Characteristics

One hundred seventy-two patients were enrolled, and CANDI was repeated in 35 patients. Mean age of the patients was 52.4 (SD = 12.2), and 57.0% were women. The most common type of cancer was breast cancer at 40.7% (n = 70). Descriptive characteristics are shown in Table 1.

4.2. Factor Analysis

The Kaiser-Meier-Olkin value of the data set was 0.862, and the p value for Bartlett's test of sphericity was < 0.001, which is appropriate for factor analysis (Chi-square = 3642.8, df = 741).

Communality values ranged between 0.51 and 0.80. When Eigen values were taken into account, the scale had a 10-factor structure. When a value of 5% was taken into account for contribution to total variance, a three-factor structure was determined. The three-factor structure option was selected. It was accordingly decided that the CANDI scale consisted of emotional, physical and social subscales. Patients' scores from the Turkish CANDI and the rotated factor structure are shown in Tables 2 - 4, respectively.

4.3. Convergent and Divergent Validity

Correlations between CANDI and HADS (rs = 0.67, P < 0.001), and BSI (rs = 0.69, P < 0.001) (convergent validity) and FACT-G (rs = -0.76, P < 0.001) (divergent validity) were moderate and significant. The depression subscale of CANDI was significantly correlated with HADS depression (rs = 0.61, P < 0.001) and BSI depression (rs = 0.70, P < 0.001). The anxiety subscale of CANDI was also significantly correlated with HADS anxiety (rs = 0.61, P < 0.001) and BSI anxiety (rs = 0.62, P < 0.001).

4.4. Reliability

Test-retest reliability was 0.87 (P < 0.001), and depression and anxiety subscale test-retest reliability values were 0.83 and 0.84, respectively (P < 0.001 for each). Mean retest day was 13.0 ± 7.4 (min-max = 3 - 28).

In terms of internal reliability, CANDI and reCANDI Cronbach alpha levels were 0.94 and 0.91, respectively. HADS, BSI and FACT-G Cronbach alpha levels were 0.90, 0.96 and 0.90, respectively. HADS and BSI depression subscale Cronbach alpha coefficients were 0.83 and 0.90, respectively, and anxiety subscale Cronbach alpha coefficients were 0.83 and 0.89.

Table 1. Sociodemographics and Diagnosis of the Patients (n = 172)

Characteristics	No. (%)
Gender	
Male	74 (43.0)
Female	98 (57.0)
Age	
< 40	26 (15.1)
40 - 60	98 (57.0)
> 60	48 (27.9)
Income (US$-annual)	
< 5000	77 (44.8)
5000 - 10000	65 (37.8)
> 10000	27 (15.7)
Missing	3 (1.7)
Education	
Primary	89 (51.7)
Secondary	22 (12.8)
High school	37 (21.5)
University	22 (12.8)
Missing	2 (1.2)
Marital status	
Single	17 (9.9)
Married	149 (86.6)
Divorced/widow	5 (2.9)
Missing	1 (0.6)
Diagnosis	
Breast	70 (40.7)
Colon	26 (15.1)
Gastric	17 (9.9)
Lung	16 (9.3)
Lymphoma	9 (5.3)
Endometrium	5 (2.9)
Rectum	5 (2.9)
Ovary	5 (2.9)
Pancreas	4 (2.3)
Liver	4 (2.3)
Prostate	3 (1.7)
Other	8 (4.7)

4.5. Cut-Off Points for Depression and Anxiety

As in the original research, when HADS was taken into account in the Turkish CANDI, anxiety (AUC = 0.88, SE =

Table 2. [Part 1] Rotated Factor (Varimax Method) Resolution of the Turkish CANDI

	Factor Loadings									
	1	2	3	4	5	6	7	8	9	10
Q30	0.77	0.19	0.11	0.26	0.07	0.14	-0.03	0.11	0.03	0.05
Q31	0.76	0.16	0.26	0.21	0.17	0.07	0.09	0.11	0.08	0.07
Q32	0.73	0.34	0.15	0.18	0.03	0.04	-0.04	0.17	-0.11	0.08
Q29	0.64	0.29	0.10	0.32	0.07	0.19	0.10	0.07	0.09	-0.15
Q33	0.60	0.36	0.35	0.06	0.00	0.09	0.09	-0.07	-0.09	0.04
Q35	0.58	0.31	0.15	0.01	-0.05	-0.04	0.22	-0.22	0.19	0.16
Q28	0.56	0.10	0.22	-0.07	0.25	0.39	0.13	0.02	0.17	0.14
Q38	0.44	0.33	0.26	-0.02	0.12	0.16	0.27	0.03	0.25	0.00
Q36	0.40	0.08	0.27	0.22	-0.02	-0.00	0.20	0.40	-0.09	-0.04
Q16	0.14	0.77	0.16	0.13	0.12	0.12	0.12	0.09	0.00	0.02
Q24	0.19	0.70	0.07	0.20	0.09	0.04	0.17	0.04	-0.02	-0.03
Q18	0.16	0.68	0.05	0.02	0.04	0.00	-0.13	-0.07	0.17	0.05
Q17	0.21	0.60	0.21	0.36	0.08	0.07	0.24	0.08	-0.05	0.04
Q25	0.44	0.59	0.03	-0.03	0.15	0.16	0.01	0.17	0.04	0.03
Q19	0.33	0.56	0.36	0.15	0.16	-0.00	-0.10	-0.06	-0.03	0.12
Q21	0.21	0.55	0.19	0.13	-0.04	-0.17	0.35	0.11	0.16	-0.14
Q39	0.26	0.29	0.76	-0.02	0.04	0.13	-0.01	0.05	0.09	-0.00
Q13	0.12	0.09	0.64	0.19	0.11	0.21	0.01	-0.17	0.16	-0.15

Table 3. [Part 2] Rotated Factor (Varimax Method) Resolution of the Turkish CANDI

	Factor Loadings									
	1	2	3	4	5	6	7	8	9	10
Q9	0.14	0.06	0.64	0.05	0.36	0.08	-0.04	0.13	-0.07	0.05
Q12	0.21	0.05	0.64	-0.06	0.04	0.11	0.05	0.21	0.24	0.06
Q10	0.34	0.14	0.55	0.17	-0.08	-0.24	0.06	0.16	0.27	0.05
Q6	0.08	0.25	0.54	0.27	0.28	0.21	0.13	0.13	-0.16	0.01
Q7	0.39	0.05	0.42	-0.00	0.03	0.24	0.36	0.22	0.03	0.15
Q11	0.17	0.31	0.42	-0.08	0.09	0.20	0.34	0.27	0.01	-0.00
Q22	0.30	0.34	0.01	0.74	-0.01	0.11	-0.04	-0.06	0.00	-0.08
Q23	0.34	0.27	0.07	0.71	0.03	0.17	-0.06	-0.04	0.05	-0.00
Q2	0.14	0.02	0.14	0.55	0.39	-0.13	0.16	0.15	0.16	0.15
Q1	0.01	0.06	0.09	0.27	0.73	-0.05	0.08	-0.01	0.03	0.06
Q4	0.00	0.08	0.37	-0.01	0.62	0.15	0.13	0.17	0.14	0.04
Q15	0.18	0.44	-0.00	-0.03	0.58	-0.05	0.33	-0.06	0.19	-0.07
Q37	0.28	0.21	0.16	-0.32	0.55	0.29	-0.13	-0.03	0.02	-0.13
Q27	0.09	0.10	0.21	0.09	0.08	0.76	0.07	0.14	-0.01	0.08
Q26	0.27	0.01	0.16	0.10	-0.03	0.72	0.15	0.02	0.11	0.12
Q5	0.11	0.22	-0.05	0.01	0.28	0.26	0.69	-0.14	0.04	-0.01
Q34	0.13	0.09	0.20	-0.05	0.09	0.172	-0.13	0.78	0.22	0.06
Q14	0.09	0.11	0.13	0.04	0.14	0.04	0.07	0.20	0.77	-0.00
Q3	-0.03	0.05	0.37	0.37	0.17	0.22	-0.09	-0.22	0.49	0.08
Q20	0.04	0.05	-0.09	-0.00	-0.05	0.13	-0.12	0.11	0.08	0.85
Q8	0.21	0.00	0.24	0.02	0.18	0.10	0.32	-0.15	-0.10	0.59

0.05, 95% C.I. = 0.77 - 0.99, non-parametric P < 0.001) and depression (AUC = 0.83, SE = 0.04, 95% C.I. = 0.75 - 0.90, non-parametric P < 0.001) were of a predictive character. Cut-off points' sensitivity and specificity values are shown in Table 5. Cut-off points of 9 for depression and 6 for anxiety are recommended for the Turkish CANDI. Again, as in the original study, a wish to speak to an authorized individual was determined as a significant factor for anxiety (AUC = 0.87, SE = 0.02, 95% C.I. = 0.82 - 0.92, non-parametric P < 0.001) and depression (AUC = 0.84, SE = 0.03, 95% C.I. = 0.78

Table 4. Descriptive Statistics of the Turkish CANDI and Other Scales

	Total Group - Total Score (n = 172)		Retest Group - Total Score (n = 35)	
	Median (Min - Max)	Mean ± SD	Median (Min - Max)	Mean ± SD
CANDI total	63 (39 - 138)	67.2 ± 21.4	76 (43 - 124)	75.7 ± 21.3
Emotional	15 (9 - 40)	17.0 ± 7.2	21 (9 - 35)	20.1 ± 7.1
Depression	7 (4 - 19)	8.1 ± 3.5	9 (4 - 18)	9.1 ± 3.7
Anxiety	4 (2 - 10)	4.1 ± 2.0	5 (2 - 9)	4.9 ± 1.9
Social	9 (8 - 31)	11.5 ± 4.9	12 (8 - 31)	13.2 ± 5.6
Physical	15.5 (7 - 35)	16.0 ± 6.1	16 (8 - 28)	17.1 ± 6.1
BSI total	25 (0 - 162)	32.9 ± 29.5	NA	NA
Depression	7 (0 - 45)	9.6 ± 9.0	NA	NA
Anxiety	4 (0 - 40)	6.4 ± 8.0	NA	NA
FACT-G	80.5 (32 - 105)	78.2 ± 15.8	NA	NA
HADS total	8 (0 - 39)	9.8 ± 8.3	NA	NA
Depression	4 (0 - 21)	5.2 ± 4.5	NA	NA
Anxiety	4 (0 - 19)	4.6 ± 4.3	NA	NA

Abbreviation: NA, not available.

- 0.90, non-parametric $P < 0.001$). Cut-off points of 8 for depression and 5 for anxiety can be used in the Turkish CANDI (Table 6).

Table 5. ROC analysis of the Turkish CANDI assessed on the basis of HADS

CANDI	Sensitivity	Specificity
Depression subscale cutoff		
5	0.95	0.21
6	0.93	0.36
7	0.93	0.49
8	0.88	0.63
9	0.80	0.78
10	0.71	0.82
Anxiety subscale cutoff		
3	0.94	0.33
4	0.88	0.47
5	0.88	0.72
6	0.88	0.80
7	0.76	0.94

Table 6. ROC Analysis of the Turkish CANDI Based on Desire to Speak to a Member of the Staff

CANDI	Sensitivity	Specificity
Depression subscale cutoff		
5	1.00	0.37
6	0.95	0.42
7	0.94	0.56
8	0.85	0.71
9	0.65	0.80
10	0.60	0.85
Anxiety subscale cutoff		
3	1.00	0.41
4	0.95	0.57
5	0.93	0.56
6	0.66	0.87
7	0.36	0.95

5. Discussion

Analysis of the results of this study indicated that the Turkish CANDI is reliable and valid. Test-retest reliability levels were close to 0.90 for both the entire scale and the subscales. This was statistically significant and close to the original research (4). In contrast to the original version, however, the mean retest day was higher in our study (3.76 vs. 13.0). The high level of reliability despite the relatively protracted period is a positive finding in terms of the applicability of the CANDI scale in Turkish. Again, sim-

ilarly to the original research, Cronbach alpha test scores, measured in order to determine the scales' internal consistency, also demonstrated internal consistency of above 0.90 in the Turkish CANDI and reCANDI (0.94 vs. 0.91). Internal consistencies for scales other than CANDI were all 0.80 or above. Accordingly, we conclude that the Turkish-language CANDI scale is reliable.

Convergent and divergent validities were measured with correlation of CANDI and HADS, and BSI and FACT-G. Similar to the original study, there were moderate and significant correlations as expected (4). Moderate correlations were expected and normal because CANDI has a different structure, which is based on the needs of the patients. Additionally, the scale also has some similar questions regarding depression, anxiety and quality of life.

In terms of factor analyses, all scale questions had high communality values, and we decided that no questions needed to be removed. An examination of the factor structure revealed some differences from the main research. In particular, Lowery was unable to perform factor analysis to determine the subscales of the scale due to sampling problems. The fact that our study involved twice as many participants as the main study allowed us to perform factor analysis. From that perspective, while five sub-factors were determined by Lowery et al. (4) (emotional, social, health care, practical and physical), when the factor structure shown in Tables 2 and 3 in our study was evaluated, we determined a 10-factor structure containing differences from the main research. In determining the final factor structure, we decided to act conservatively and determine a three-factor structure. In addition to ease of application, that decision was also influenced by the contribution of a variance of factors explained before rotation (5% limit). The examination of the Turkish CANDI factor structure revealed that the emotional subscale in particular was almost identical to the main research (Turkish CANDI emotional subscale questions: 28, 29, 30, 31, 32, 33, 35, 36 and 38). As in the original scale, questions determined for depression and anxiety were observed to be located within the emotional factor in the Turkish CANDI. The examination of the physical subscale showed that all seven questions in the Turkish CANDI were also in the physical subscale in the original study. Four questions in the main scale did not appear in the Turkish CANDI (physical subscale questions: 16, 17, 18, 19, 21, 24 and 25). Two of these questions concerned sexuality and having children, and two were about sleep. According to our results (Tables 2 and 3), these questions represented different factor structures. At this point, the difference from the main study was regarded as normal by the authors because having children and sexuality are highly combined matters in Turkish society (17). Again, in Tables 2 and 3, the two questions about sleep represented a factor together with the question about financial problems. Economic difficulties are known to give rise to sleep problems (18). This relationship was reflected in the scale factor structure.

Some questions in the health care, practical life and social subscales of the CANDI scale established by Lowery et al. (4) were combined under a different factor in the Turkish CANDI (social subscale questions: 6, 7, 9, 11, 12, 13 and 39). Three of these questions appear in the social subscale in the original research, two in health care, one in practical life and one in no subscale. These questions concerned worries about the care of the individual and dependents thereof and about help with housework, questions about the health care team and medical care and questions about how the family would cope with the patient's disease. This subscale was eventually titled the social subscale, since the original social subscale had more questions combined within the Turkish CANDI than any of the other subscales.

5.1. Limitations of the Study

Our study has some strengths and limitations. Our sample is relatively large, and therefore, we could exclude the patients who have missing questions in the CANDI. There is no such scale in the Turkish language that measures biopsychosocial distress depending on the needs of cancer patients. One of our limitations is that we planned to have the work translated by a bilingual professional translator, but we were not able to. This might increase the contribution of the owner of the scale to final scale.

The Turkish-language version of the CANDI scale developed by Lowery et al. (4) is a valid and reliable scale in cancer patients. The Turkish-language version has a three-factor structure (emotional, physical and social). This scale can be used widely in clinical settings to practically assess the needs and biopsychosocial outcomes of cancer patients.

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Footnote

Authors' Contribution: Study concept and design: Nazim Ercument Beyhun; acquisition of data: Serdar Karakullukcu, Bekir Bulut, Sehbal Yesilbas; analysis and interpretation of data: Nazim Ercument Beyhun; drafting of the manuscript: Nazim Ercument Beyhun, Gamze

Can, Ahmet Tiryaki, Murat Topbas; critical revision of the manuscript for important intellectual content: Nazim Ercument Beyhun; statistical analysis: Nazim Ercument Beyhun; administrative, technical and material support: Murat Topbas, Halil Kavgaci, Nazim Ercument Beyhun; study supervision: Nazim Ercument Beyhun, Gamze Can, Ahmet Tiryaki, Halil Kavgaci, Murat Topbas.

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