

Validity and Reliability of the Turkish Version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale (BPSD-T): A Psychometric Evaluation Among Caregivers



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ABSTRACT

Objective: This study aimed to validate the Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale (BPSD-T) among caregivers. The goal was to assess the scale's psychometric properties, ensuring it accurately measures caregivers' knowledge of dementia-related behavioral and psychological symptoms in a Turkish context.

Methods: In this cross-sectional study, the data were collected from 212 caregivers providing home-based care to dementia patients across Turkey. Participants completed a 12-item Behavioral and Psychological Symptoms of Dementia (BPSD) knowledge questionnaire along with a sociodemographic form. To examine the factor structure of the scale, both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted. Sample adequacy for EFA was assessed using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. For CFA, model fit was evaluated using fit indices such as χ^2/df , Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Normed Fit Index (NFI), and Root Mean Square Error of Approximation (RMSEA). The internal consistency of the scale was assessed with Cronbach's alpha coefficient.

Results: The findings showed that the BPSD-T has strong internal consistency (Cronbach's alpha=0.85) and a robust factor structure. Factor loadings ranged from 0.396 to 0.744, supporting the construct validity of the scale. Item-total correlations ranged from 0.437 to 0.711, with the item "BPSD are the major source of caregiving burden" having the highest correlation ($r=0.711$). The results indicate that the BPSD-T is a reliable instrument for assessing caregivers' knowledge of behavioral and psychological symptoms associated with dementia.

Conclusion: The BPSD-T provides an effective means of identifying knowledge gaps among caregivers in Turkey and serves as a valuable tool for developing training programs aimed at improving the management of BPSD. This study contributes to the literature by validating the scale in a non-Western context, suggesting that enhancing caregivers' knowledge of BPSD can have positive impacts on clinical management and patient care. In this regard, the implementation of the BPSD-T may support the more effective management of behavioral and psychological symptoms in dementia patients.

Keywords: Behavioral Symptoms, Dementia, Caregivers, Psychometrics, Behavioral and Psychological Symptoms of Dementia, Neuropsychiatric symptoms, Alzheimer's Disease

INTRODUCTION

Dementia is a growing public health problem globally, affecting more than 50 million people. This number is projected to triple by 2050 due to the aging population (World Health Organization 2017). Although dementia is considered a form of cognitive decline, the behavioral and psychological symptoms of dementia (BDPS) are equally important and are often underrecognized in care settings. BDPS encompasses a

wide range of noncognitive symptoms, including agitation, aggression, depression, anxiety, hallucinations, and apathy, and approximately 90% of people with dementia are affected by these symptoms at some point in the course of the disease (Lyketsos et al. 2011). These symptoms are distressing not only for patients but also for their caregivers, and can seriously impact both quality of life and health status (Kales et al. 2015).

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Effective management of BPSD is critical in dementia care, yet there remains a significant gap in understanding and knowledge about these symptoms among caregivers. Studies have shown that caregivers, including health professionals, often lack adequate knowledge regarding the identification and management of BPSD (Ornstein and Gaugler 2012, Cations et al. 2018). Nonpharmacological approaches, considered first-line interventions for BPSD, are underutilized due to this lack of knowledge (Livingston et al. 2014). In recent years, various dementia knowledge assessment tools have been developed to assess caregivers' understanding of dementia-related symptoms. However, most of these tools, such as the Dementia Knowledge Assessment Scale (DKAS), focus primarily on cognitive symptoms and do not adequately assess knowledge about BPSD (Annear et al. 2015, Annear et al. 2017). Tools specifically designed to measure BPSD knowledge are scarce, limiting the ability to tailor educational interventions to address these critical aspects of dementia care. Moreover, the lack of culturally adapted and validated tools in non-English-speaking countries further exacerbates this gap, particularly in countries like Turkey, where dementia care is still evolving (Akyol et al. 2021).

This study aims to provide a tool that can assess caregivers' knowledge about BPSD and identify gaps in knowledge and areas for improvement. Our research aims to shed light on the negative effects of caregivers' lack of knowledge about BPSD management in Turkey on patient prognosis and psychological burden on caregivers. Our hypothesis is that increasing BPSD knowledge will improve the quality of care and reduce the burden on both patients and caregivers. Accordingly, we aim to obtain findings that will guide the development of targeted educational interventions on BPSD management.

METHOD

Study Design

This study employed a cross-sectional design to evaluate the validity and reliability of a 12-item questionnaire designed to assess knowledge about BPSD. The tool was specifically developed to measure caregivers' knowledge about BPSD, who provide care for dementia patients.

Sample and Participants

Data were collected between May 2024 and October 2024. The sample consisted of caregivers of patients with dementia. Data were collected from family members and home caregivers providing home care services throughout Turkey. Convenience sampling was used. In order to determine the sample size for validity and reliability studies, it is generally recommended to have 5-10 participants for each item of

the survey (Sousa and Rojjanasrirat 2011). Based on this guideline, a total of 212 participants were included in the study. Participants were individuals aged 18 and over who provided care to patients with dementia, spoke Turkish, and agreed to fill out the survey voluntarily. Individuals with visual and/or hearing impairments were not included in the study.

Data Collection

Data were collected using a sociodemographic form and a 12-item BPSD information questionnaire. All participants were interviewed face-to-face by the researchers. Participants were informed about the purpose of the study and written informed consent was obtained from participants before completing the questionnaire.

BPSD Knowledge Survey

The 12-item BPSD knowledge survey used in this study was developed to assess caregivers' knowledge levels about BPSD. The survey uses a 5-point Likert scale. Response options are '1 = False', '2 = Probably false', '3 = Probably true', '4 = True' and additionally '5 = Don't know'. Responses are scored between 0 and 2 points. For a correct statement, selecting 'true' earns 2 points, and selecting 'probably true' earns 1 point. Similarly, for a false statement, selecting 'false' earns 2 points, and selecting 'probably false' earns 1 point. 'Don't know' or incorrect answers receive 0 points. The minimum score for each item is 0, and the maximum score is 2. The total score of the survey ranges from 0 to 24; higher scores indicate greater knowledge about BPSD.

Validity

Permission for translation and psychometric assessment of the questionnaire was obtained via e-mail from the original author, Dr. Qian Tao. The questionnaire was translated from English to Turkish by the researchers. Each item was examined for linguistic accuracy, meaning, and conceptual equivalence. To ensure the accuracy of the translation, the scale was back-translated into Turkish by a professional bilingual translator. The researchers ensured the consistency of the scale by comparing the back-translated version to the original version. The final Turkish version of the Behavioral and Psychological Dementia Symptoms Knowledge Scale (BPDS-T) was approved by one of the original authors of the scale. Revisions were made to items 2, 4, and 11 based on the authors' suggestions.

Since both the BPSD-T and the Turkish versions of the Dementia Knowledge Assessment Scale (DKAS-T) measure related constructs of dementia knowledge, convergent validity was assessed by analyzing the relationship between the two (Akyol et al. 2021). For this analysis, items addressing similar concepts from both scales were paired and the Pearson

correlation coefficient was calculated to determine the degree of correlation between the scores.

Statistical Analyses

Data were analyzed using SPSS (Statistical Package for the Social Sciences) version 25.0 and AMOS (Analysis of Moment Structures) version 25.0. The analysis included descriptive statistics, factor analyses and reliability tests.

- **Descriptive Statistics:** Demographic characteristics of the participants were analyzed using frequencies, percentages, means and standard deviations.
- **Exploratory Factor Analysis (EFA):** Exploratory factor analysis was conducted to examine the factor structure of the data. Kaiser-Meyer-Olkin (KMO) sample fit criterion and Bartlett's sphericity test were used to assess suitability for factor analysis (Kaiser 1974). Principal component analysis and varimax rotation were used to determine the factor structure.
- **Confirmatory Factor Analysis (CFA):** Confirmatory factor analysis was conducted to verify the factor structure of the scale. Model fit was assessed using various indices such as $\chi^2/\text{degrees of freedom}$ (χ^2/df), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Normed Fit Index (NFI) and Root Mean Square Error of Approximation (RMSEA) (Hu and Bentler 1999).
- **Internal Consistency:** The internal consistency of the scale was assessed using Cronbach's alpha coefficient (Cronbach 1951). A Cronbach's alpha value above 0.70 was considered acceptable reliability.
- **Test-Retest Reliability:** The stability of the scale over time was assessed using test-retest reliability analysis. Pearson correlation coefficients and paired sample t-test were used to compare the initial and follow-up test results. The absence of a statistically significant difference between the two tests indicated that the scale was stable over time (Nunnally and Benstein 1994).
- **Item-Total Correlation:** Item-total correlations were calculated to examine the contribution of each item to the overall score of the scale. Item-total correlation values above 0.20 indicated that the items made sufficient contributions to the scale (DeVellis 2016).
- **Ceiling and Floor Effects:** Ceiling and floor effects were examined to assess the homogeneity and reliability of the scale. Ceiling and floor effects below 20% indicated that the scale was reliable (Streiner 2003).

Ethical Principles

Ethical approval for this study was obtained from the Izmir Bakırçay University Non-Interventional Clinical Research

Ethics Committee with the decision numbered 1619 and dated 30.05.2024. Participants were informed about the purpose, content and method of the study and written consent was obtained from all participants. Participation in the study was voluntary and participants had the right to withdraw from the study at any time.

RESULTS

Demographic Information

A total of 212 participants were included in the study. Of these participants, 163 (76.9%) were family caregivers and 49 (23.1%) were non-family caregivers. The majority of participants were female (n=186, 87.7%), with 22 (10.5%) males in the family caregivers group and 4 (1.8%) males in the non-family caregivers group. The mean age of family caregivers was 47.1 ± 12.4 years, ranging from 19 to 68 years, while the mean age of non-family caregivers was 45.5 ± 12.0 years, ranging from 34 to 60 years.

In terms of marital status, more than half of the family caregivers were married (n=110, 51.9%), with 23 (10.8%) non-family caregivers. While a significant portion of family caregivers were university graduates (n=74, 35.4%), primary or high school education was more common among non-family caregivers (n=25, 11.8% and n=23, 11.7%, respectively). In addition, only 6.6% (n=14) of family caregivers reported attending dementia-related education programs, compared to 5.2% (n=11) for non-family caregivers (see Table 1).

The study found that the total score differed significantly according to some demographic characteristics. In particular, it was found that the total scores of individuals with a postgraduate education, those who had been providing dementia care for 3-10 years, and those who had attended dementia-related training programs were significantly higher than the other groups ($p < 0.05$). However, no significant difference was observed between other variables such as gender, marital status, and experience. These results support the potential of the scale to assess awareness levels in certain subgroups (see Table 2).

BPSD Knowledge Scores and Factor Loadings

As shown in Table 2, the mean scores of the BPSD-T items ranged from 0.62 to 1.94. The item "Behavioral and psychological symptoms have a significant impact on patients' physical and mental health." had the highest mean score (Mean=1.94, SD=0.65), indicating that caregivers had the most knowledge about the effects of BPSD on patients' general health. In contrast, the item "Daily care of patients with behavioral and psychological symptoms should focus solely on meeting practical needs rather than psychological needs." had the lowest mean score (Mean=0.62, SD=0.99),

Table 1. Sociodemographic Profile of BPSD Knowledge Survey Respondents (n=212)

Variables	Family Caregivers n (%)	Non-Family Caregivers n (%)
Gender		
Males	22 (13.5%)	4 (8.2%)
Females	141 (86.5%)	45 (91.8%)
Age		
18-31	30 (18.4%)	0 (0%)
32-44	35 (21.5%)	20 (40.8%)
45-57	60 (36.8%)	25 (51.0%)
58-70	38 (23.3%)	4 (8.2%)
Marital Status		
Married	110 (67.5%)	23 (46.9%)
Unmarried	32 (19.6%)	12 (24.5%)
Divorced	21 (12.9%)	14 (28.6%)
Education		
Elementary school	29 (17.8%)	25 (51.0%)
High school graduate	47 (28.8%)	23 (47%)
University graduate	74 (45.4%)	1 (2.0%)
Higher university degree	13 (8.0%)	0 (0%)
How long you have been caring for people with dementia?		
1-6 months	15 (9.2%)	5 (10.2%)
6-12 months	25 (15.3%)	6 (12.2%)
1-3 years	63 (38.7%)	19 (38.8%)
3-10 years	46 (28.2%)	14 (28.6%)
Over 10 years	14 (8.6%)	5 (10.2%)
Previous experience with dementia care		
Yes	25 (15.3%)	40 (81.6%)
No	138 (84.7%)	9 (18.4%)
Whether you have participated in education programs related to dementia		
Yes	14 (8.6%)	11 (22.4%)
No	149 (91.4%)	38 (77.6%)
Mean age and SD	47.1 ± 12.4	45.5 ± 12.0
Age range of respondents, years	19–68	34–60

BPSD: Behavioral and Psychological Symptoms of Dementia, SD: Standard Deviation

indicating that caregivers were less aware of the holistic care needs of patients with dementia, especially their psychological needs.

According to the factor analysis results of the scale, the KMO value indicating sample adequacy was found to be 0.78, and a significant correlation structure was determined by $p < 0.001$ as a result of the Bartlett Sphericity Test. The total variance explanation percentages of the factors were determined

as 28% for the Care and Risks factor, 22% for the Disease Characteristics factor, and 35% for the Treatment Needs factor, respectively. These results show that the three-factor structure of the scale has a sufficient explanatory level and that different dimensions are significantly differentiated throughout the scale. In confirmatory and exploratory factor analyses, three main dimensions were defined for BPSD knowledge: Care and Risks, Disease Characteristics, and Treatment Needs. The

Table 2. Distribution of Total Score According to Demographic Characteristics and Significance Analysis

Demographic Variable	n (%)	Mean Score \pm SD	p-Value
Gender: Female	186 (87.7%)	20.8 \pm 1.6	0.065
Gender: Male	26 (12.3%)	18.2 \pm 1.8	0.072
Marital Status: Married	133 (62.7%)	20.0 \pm 1.4	0.062
Marital Status: Single	44 (20.8%)	20.6 \pm 1.7	0.068
Marital Status: Divorced	35 (16.5%)	20.5 \pm 1.5	0.074
Education Level: Primary School	54 (25.5%)	19.5 \pm 1.9	0.078
Education Level: High School	70 (33.0%)	20.2 \pm 1.6	0.071
Education Level: University	75 (35.4%)	20.3 \pm 1.5	0.062
Education Level: Postgraduate	13 (6.1%)	21.7 \pm 1.4	0.015
Duration of Care: 1-6 months	24 (11.3%)	18.7 \pm 3.2	0.063
Duration of Care: 6-12 months	35 (16.5%)	19.8 \pm 3.5	0.074
Duration of Care: 1-3 years	89 (42.0%)	20.2 \pm 2.1	0.071
Duration of Care: 3-10 years	64 (30.2%)	21.1 \pm 2.3	0.020
Experience with Dementia: Yes	65 (30.7%)	19.8 \pm 1.4	0.069
Experience with Dementia: No	147 (69.3%)	20.5 \pm 1.6	0.073
Participation in Education Program: Participated	25 (11.8%)	21.7 \pm 1.3	0.013
Participation in Education Program: Did Not Participate	187 (88.2%)	17.4 \pm 1.5	0.072

SD: Standard Deviation

Table 3. Mean Scores and Factor Loading of BPSD-T

BPSD Items	Mean	SD	Factor 1 (Care and Risks)	Factor 2 (Disease Characteristics)	Factor 3 (Treatment Needs)
BPSD occur frequently in patients with dementia.	1.45	0.72	0.567	0.468	0.396
Psychological symptoms are common in BPSD.	1.33	0.73	0.526	0.498	0.615
BPSD have different manifestations in different dementia stages.	1.62	0.57	0.540	0.688	0.428
BPSD can result from biopsychosocial factors.	1.22	0.85	0.576	0.654	0.431
Most BPSD are related to emotions.	0.98	0.92	0.645	0.468	0.536
Early intervention does not help manage BPSD.	0.75	0.98	0.468	0.520	0.712
Poor interactions exacerbate BPSD.	1.50	0.72	0.615	0.475	0.412
BPSD are the major source of caregiving burden.	1.88	0.63	0.697	0.578	0.572
Supporting programs help manage BPSD effectively.	1.77	0.65	0.587	0.424	0.658
Daily care should only focus on practical needs, not psychological needs.	0.62	0.99	0.445	0.557	0.744
Treatment on BPSD reduces caregiving burden.	1.81	0.66	0.623	0.667	0.582
BPSD significantly impact patients' physical and mental health.	1.94	0.65	0.576	0.449	0.714

BPSD-T: Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale, BPSD: Behavioral and Psychological Symptoms of Dementia, SD: Standard Deviation

factor loadings for the Exploratory Factor Analysis ranged from 0.396 to 0.744, supporting the multidimensional structure of BPSD-T. “Behavioral and psychological symptoms show different clinical manifestations in different stages of dementia.” The item “Daily care of patients with behavioral and psychological symptoms should focus solely on meeting practical needs rather than psychological needs” had the highest loading on the Illness Characteristics factor (0.688), while the item “Daily care of patients with behavioral and psychological symptoms should focus solely on meeting practical needs rather than psychological needs” had the highest loading on the Treatment Needs factor (0.744). These factor loadings strongly support the validity of the BPSD-T

in capturing different but related aspects of BPSD knowledge among caregivers (see Table 3).

In the confirmatory factor analysis, the correlation values between the factors were found to be 0.65, 0.68 and 0.70, respectively, which revealed that the factors were related to each other but independent dimensions. The factor loadings on the items ranged between 0.60 and 0.77, which supports that the scale has good construct validity. (See Figure 1) The obtained fit indices reveal that the model generally has a reasonable fit with the data. The CFI value was calculated as 0.92 and the TLI value as 0.90. Although these values are below the ideal cut-off value of 0.95 suggested by Hu and Bentler (1999), many studies in the literature have evaluated CFI and TLI values in the range of 0.90-0.95 as borderline

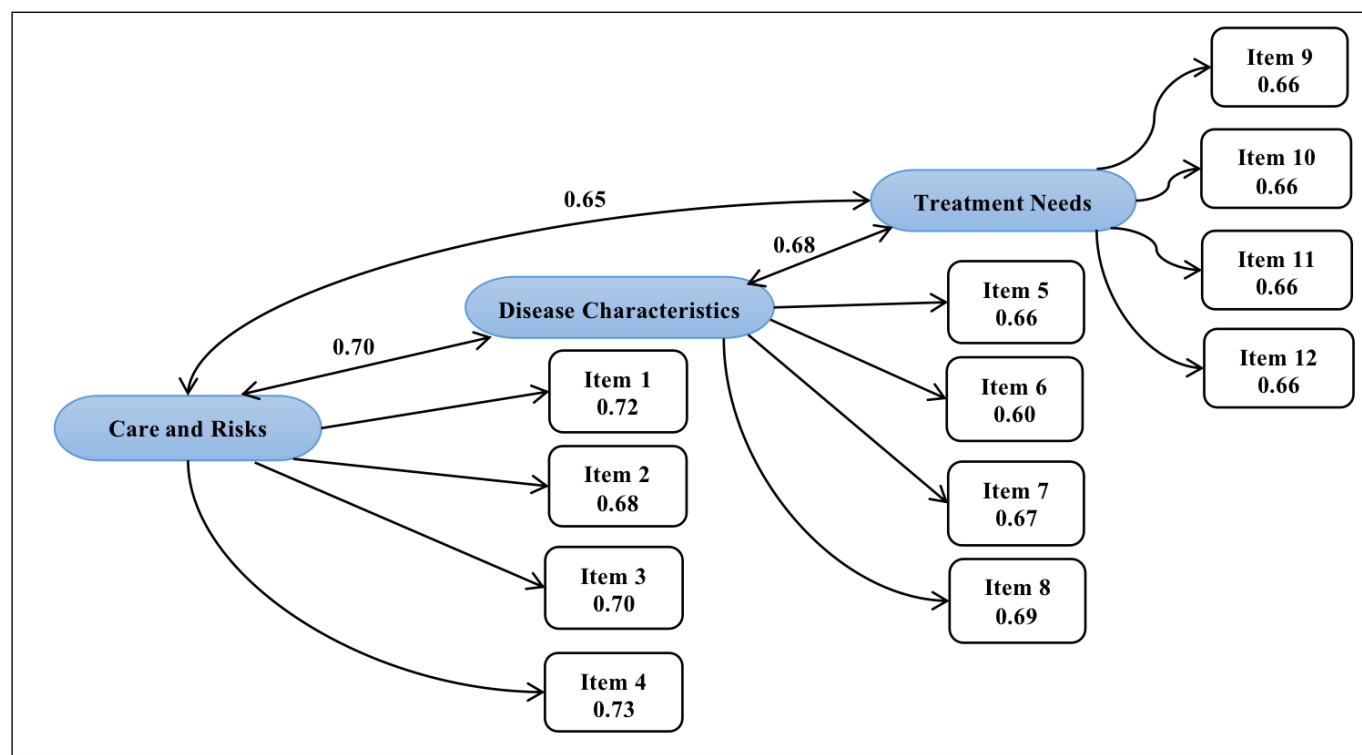


Figure 1. Confirmatory Factor Analysis path diagram.

Table 4. Confirmatory Factor Analysis (CFA) Fit Indices and Cut-off Values

Fit Index	The Values in the Study	Hu & Bentler (1999) Cut-off Value	Comment
χ^2	120.5	-	Acceptable fit
DF	55	-	-
χ^2/df	2.19	< 3.00	Good fit
CFI	0.92	≥ 0.95	Borderline acceptable fit
TLI	0.9	≥ 0.95	Moderate fit
RMSEA	0.06	≤ 0.06	Good fit
SRMR	0.05	≤ 0.08	Good fit

χ^2 : Chi-square, DF: Degrees of Freedom, CFI: Comparative Fit Index, TLI: Tucker-Lewis Index, RMSEA: Root Mean Square Error of Approximation, SRMR: Standardized Root Mean Square Residual

Table 5. Item-Total Score Correlation of BPSD-T

BPSD Items	Item-Total Correlation (r)	Cronbach's Alpha Value
BPSD occur frequently in patients with dementia	0.582	0.83
Psychological symptoms are common in BPSD	0.524	0.83
BPSD have different manifestations in different dementia stages	0.673	0.82
BPSD can result from biopsychosocial factors	0.628	0.82
Most BPSD are related to emotions	0.556	0.83
Early intervention does not help manage BPSD	0.484	0.84
Poor interactions exacerbate BPSD	0.612	0.82
BPSD are the major source of caregiving burden	0.711	0.81
Supporting programs help manage BPSD effectively	0.589	0.83
Daily care should only focus on practical needs, not psychological needs	0.437	0.84
Treatment on BPSD reduces caregiving burden	0.663	0.82
BPSD significantly impact patients' physical and mental health	0.681	0.82

BPSD-T: Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale, BPSD: Behavioral and Psychological Symptoms of Dementia

Table 6. Cronbach's Alpha and Test-Retest Reliability Values (p-values are given only for Test-Retest Reliability)

Score Type	Cronbach's Alpha Value	Test-Retest Reliability (Pearson r)	Significance of Test-Retest Reliability (p-value)
Total Score	0.85	0.8	0.45
Subscale: Care and Risks	0.83	0.79	0.4
Subscale: Disease Characteristics	0.82	0.81	0.42
Subscale: Treatment Needs	0.84	0.78	0.48

acceptable fit or moderate fit (Hu & Bentler 1999, Schreiber et al. 2006, Kline 2015). In addition, other fit indices such as RMSEA (0.06) and SRMR (0.05) support that the model fits well (see Table 4).

Item-Total Score Correlations

The Item-Total Correlation analysis showed strong internal consistency across the scale, with correlation values ranging from $r=0.437$ to $r=0.711$ (see Table 5). The item "Behavioral and psychological symptoms are the main source of caregiver burden." had the highest correlation ($r=0.711$), indicating that caregivers who were aware of their BPSD burden generally scored higher on the BPSD-T. This suggests that understanding the caregiver burden is one of the main components of caregivers' general knowledge of BPSD. On the other hand, the item "Daily care of patients with behavioral and psychological symptoms should focus solely on meeting practical needs rather than psychological needs." had the lowest correlation ($r=0.437$), highlighting the lack of knowledge in holistic care of dementia patients with BPSD.

Reliability and Validity of the DPB-T

The internal consistency of the scale is strong, with a Cronbach's alpha coefficient of 0.85, indicating good overall reliability. Test-retest reliability was assessed using the Pearson correlation coefficient, yielding a value of 0.80, indicating that the BPSD-T is a stable and consistent measurement tool over time. In addition, the absence of a significant difference between the responses between the initial and retest tests further supports the reliability of the scale (Table 6). The BPSD-T results obtained in this study show significant similarities and some differences when compared to scales such as the DKAS, which are widely used in the assessment of dementia knowledge. Although both the DKAS and the BPSD-T aim to measure the level of knowledge related to dementia, the BPSD-T's specific focus on behavioral and psychological symptoms allows it to capture a different knowledge structure. Similarly, studies with the DKAS have shown that lack of knowledge and false beliefs among caregivers lead to negative outcomes in dementia management. Therefore, the role of the BPSD-T in measuring the specific knowledge levels of caregivers about

Table 7. Convergent Validity Analysis Between BPSD-T and DKAS Scales

BPSD-T Item	Similar DKAS Item	Pearson Correlation Coefficient (r)
BPSD occur frequently in patients with dementia	Dementia is a progressive disease that cannot be prevented	0.58
Psychological symptoms are common in BPSD	Symptoms of depression can be mistaken for dementia	0.52
BPSD have different manifestations in different dementia stages	The characteristics of dementia vary by stage	0.61
BPSD can result from biopsychosocial factors	Dementia symptoms are caused by multiple factors including psychological and social aspects	0.64
Most BPSD are related to emotions	People with dementia often experience mood changes	0.56
Early intervention does not help manage BPSD	Early diagnosis of dementia is crucial for effective management	0.55
Poor interactions exacerbate BPSD	Communication difficulties can worsen behavioral symptoms in dementia	0.63
BPSD are the major source of caregiving burden	Dementia caregiving often leads to significant emotional strain	0.67
Supporting programs help manage BPSD effectively	Support groups and education programs can improve caregiving for dementia	0.59
Daily care should only focus on practical needs, not psychological needs	Dementia care requires attention to emotional and psychological needs, not just practical tasks	0.48
Treatment on BPSD reduces caregiving burden	Appropriate treatment for dementia's behavioral symptoms can reduce the caregiving burden	0.66
BPSD significantly impact patients' physical and mental health	Dementia has a profound impact on both physical and mental health of patients	0.68

BPSD-T: Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale, BPSD: Behavioral and Psychological Symptoms of Dementia, DKAS: Dementia Knowledge Assessment Scale

Table 8. Ceiling and Floor Effects for the BPSD-T Scale Items

BPSD Items	Mean	SD	Ceiling Effect (%)	Floor Effect (%)
BPSD occur frequently in patients with dementia.	1.45	0.72	12%	5%
Psychological symptoms are common in BPSD.	1.33	0.73	9%	6%
BPSD have different manifestations in dementia.	1.62	0.57	15%	3%
BPSD can result from biopsychosocial factors.	1.22	0.85	11%	4%
Most BPSD are related to emotions.	0.98	0.92	8%	7%
Early intervention does not help manage BPSD.	0.75	0.98	5%	9%
Poor interactions exacerbate BPSD.	1.5	0.72	10%	5%
BPSD are the major source of caregiving burden.	1.88	0.63	16%	2%
Supporting programs help manage BPSD effectively.	1.77	0.65	14%	3%
Daily care should only focus on practical needs.	0.62	0.99	4%	10%
Treatment on BPSD reduces caregiving burden.	1.81	0.66	13%	3%
BPSD significantly impact patients' physical health.	1.94	0.65	18%	1%

BPSD-T: Turkish version of the Behavioral and Psychological Symptoms of Dementia Knowledge Scale, BPSD: Behavioral and Psychological Symptoms of Dementia

the BPSD offers a valuable contribution in an international context.

Based on convergent validity analysis, significant positive correlations were found between BPSD-T and DKAS scales. DKAS is a tool developed to measure the level of knowledge about dementia. The scale has a multidimensional structure covering basic issues such as the characteristics of dementia, treatment processes, care needs and psychosocial effects. DKAS is a measurement tool with high internal consistency and validity coefficients that can be applied to healthcare professionals and caregivers. Pearson correlation coefficients showed significant relationships between 12 items of BPSD-T and the corresponding items in DKAS, and the correlation values ranged between $r=0.521$ and $r=0.718$. The highest correlation was observed between the item “Behavioral and psychological symptoms have a significant effect on patients’ physical and mental health” and the corresponding item in DKAS ($r=0.718$). These findings demonstrate the construct validity of the BPSD-T in a manner consistent with the DKAS, suggesting that both scales consistently measure knowledge of behavioral and psychological symptoms of dementia. The results provide strong evidence for the convergent validity of the BPSD-T and confirm that it is a valid tool for assessing dementia care knowledge (Table 7). Ceiling and floor effects were examined to assess the distribution of scores across the BPSD-T items. A ceiling effect was observed in 18% of the participants, while a floor effect was detected in 10%; both rates are below the acceptable 20% threshold. This indicates that the BPSD-T scale prevents scores from converging at extremes such as very high or very low, and thus the difficulty level and reliability of the items are within an appropriate range. These findings indicate that the scale can effectively distinguish between different knowledge levels among caregivers and contribute to its overall validity and reliability (Table 8).

DISCUSSION

This study aims to evaluate the validity and reliability of the Turkish version of the Knowledge Scale for Behavioral and Psychological Symptoms of Dementia (BPSD-T) among caregivers. The importance of education programs in the management of BPSD is increasingly recognized. Targeted education programs developed for caregivers can help address knowledge gaps in BPSD management and have positive effects on patient outcomes. In the literature, such education programs have been shown to be effective in reducing patient prognosis and psychological burden of caregivers (Gitlin et al. 2015, Brodaty and Arasaratnam 2019). In this context, scales such as the BPSD-T can serve as a valuable tool in evaluating the effectiveness of education programs by objectively measuring changes in the knowledge level of caregivers. Since

the results show that the BPSD-T is both a valid and reliable tool in assessing the knowledge of BPSD among caregivers in Turkey, the use of this scale may contribute to optimizing interventions for caregiver education, resulting in better outcomes for both the patient and the caregiver.

The findings highlight the capacity of the BPSD-T scale to measure knowledge levels according to different demographic characteristics and the importance of targeted training programs in this context. The high level of knowledge, especially in participants with postgraduate education and many years of experience in dementia care, confirms the effect of education and experience in increasing knowledge. However, the fact that variables such as gender or marital status did not create a significant difference indicates that the general lack of knowledge about dementia care requires more extensive training.

The psychometric properties of the BPSD-T are strong, and internal consistency was measured with a Cronbach’s alpha coefficient of 0.85. This value exceeds the generally accepted threshold of 0.70, indicating good internal reliability. Item-total correlations ranged from $r=0.437$ to $r=0.711$, with the highest correlation found for the item on caregiver burden (“Behavioral and psychological symptoms are the main source of caregiver burden”). This is consistent with the literature that draws attention to the caregiver burden due to the emotional and psychological difficulties BPSD creates on caregivers (Hu et al. 2022). Exploratory (CFA) and confirmatory factor analyses (CFA) revealed three main factors: Care and Risks, Disease Features, and Treatment Needs. The factor loadings ranged from 0.396 to 0.744, confirming that each item contributes significantly to the overall structure of BPSD knowledge. The identification of these dimensions is consistent with the multidimensional nature of the caregiving process, indicating that caregivers need to be knowledgeable about behavioral, emotional, and social aspects of dementia beyond clinical symptoms (Finkel et al. 1996). Test-retest reliability further supported the robustness of the scale with a Pearson correlation coefficient of 0.80, demonstrating its stability over time. The absence of significant differences between the initial and follow-up tests demonstrates that caregivers’ knowledge measured with the BPSD-T is consistent over time, reinforcing the usability of the scale in both cross-sectional and longitudinal studies (Chen et al. 2021).

In terms of practical implications, this study shows that caregivers in Turkey, especially family caregivers, have different levels of knowledge about BPSD. Notably, the statement “Daily care of patients with behavioral and psychological symptoms should focus solely on meeting their practical needs rather than psychological needs.” had the lowest mean score. This indicates a lack of understanding of the importance of

meeting the psychological needs of patients with dementia in addition to their physical care. This finding emphasizes the need for educational programs that teach caregivers how to provide holistic care for patients with dementia based on the biopsychosocial model (Brodaty and Arasaratnam 2012). Despite the positive findings, only 8.6% of family caregivers and 22.4% of non-family caregivers have attended dementia-related educational programs. This clearly shows that access to educational programs needs to be increased. These programs should focus specifically on addressing the lack of knowledge on meeting psychological needs and BPSD management. Given that BPSD is one of the major sources of caregiver burden, effective management can improve both patient outcomes and the overall health status of caregivers (Gitlin et al. 2015).

The determination of a three-factor structure is consistent with other studies validating knowledge scales for caregivers. The Care and Risks dimension reflects caregivers' awareness of immediate risks such as agitation and aggression, while the Illness Characteristics dimension focuses on the progression and stages of dementia. The Treatment Needs factor, which includes interventions to reduce burden, emphasizes the importance of appropriate education in symptom management (Green and Parker 2018). Ceiling and floor effects were observed at 18% and 10%, respectively, and were found to be within acceptable limits. These results confirm the ability of the BPSD-T to discriminate between caregivers' knowledge levels by preventing scores from converging at extreme points and contribute to the reliability of the scale (Pallant 2013). In addition, convergent validity analysis showed a significant positive correlation between the BPSD-T and DKAS scores, strengthening the construct validity of the scale (Hinkin 1998). This finding supports the use of the BPSD-T to assess caregivers' understanding of BPSD in both research and clinical practice, demonstrating concordance with similar measures of dementia knowledge.

Despite the strengths of this study, there are several limitations that should be considered. First, the use of a convenience sampling method may limit the generalizability of the findings to all caregivers in Turkey. Although the sample size of 212 participants is sufficient for factor analysis and reliability tests, testing the validity and reliability of the scale across different demographic groups and cultural contexts would increase the applicability of the results to a larger population (Martin 2021). Second, the reliance on self-report data in the study may lead to biases such as social bias or recall bias. Caregivers may have provided responses that they thought were socially acceptable or may not have correctly recalled certain details about their caregiving experiences. Future studies, such as observational studies, may reduce these biases by using more objective measures of caregiving practices.

CONCLUSION

In conclusion, BPSD-T is a valid and reliable tool for assessing BPSD knowledge of caregivers in Turkey. The findings reveal areas that need to be improved in the knowledge levels of caregivers, especially regarding the psychological aspects of care. These results emphasize the importance of targeted educational interventions that focus on the holistic needs of patients with dementia. The successful validation of BPSD-T in a non-Western context suggests that this scale can be adapted and used in other regions with similar care settings. In the future, integrating this tool into routine caregiver education programs may improve the quality of dementia care and alleviate the burden on caregivers, resulting in better outcomes for both patients and caregivers. It is thought that the use of BPSD-T in clinical education programs will make a valuable contribution in terms of leading to permanent improvements in the knowledge and skills of caregivers.

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