Editors' Choice

ORIGINAL PAPER

Nagoya J. Med. Sci. **88**. 375–388, 2026
doi:10.18999/nagjms.88.3.375

Initial development and psychometric evaluation of the Dementia Worry Assessment Scale for middle-aged and older adults in Japan

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ABSTRACT

Dementia worry is an emotional response to the perceived threat of developing dementia. This study aimed to develop Dementia Worry Assessment Scale (DWAS) for middle-aged and older adults in Japan, evaluating its reliability and validity through a cross-sectional survey. A 30-item preliminary DWAS was developed based on existing scales related to dementia worry, as well as Japanese middle-aged and older adults' specific emotional responses regarding dementia onset. Participants were over 40 years of age and were recruited from community health promotion groups and residents' association activities. There were 152 valid responses from 182 participants. Data were analyzed through item analysis, exploratory factor analysis, internal consistency, reliability testing, and criterion-related validity assessment. The number of responses was 152 (valid response rate = 83.5%), of whom 71.1% were women and 28.9% were men. The mean age and standard deviation were 59.4 ± 10.9 years. The finalized 16-item DWAS comprises two domains: "Threat from having dementia" (7 items) and "Apprehension about developing dementia" (9 items). The internal consistency reliability estimated by Cronbach's alpha was 0.952 for the overall scale, and 0.956 and 0.940 for the two subscales, respectively. Significant positive correlations were observed between the DWAS total score and the Japanese version of the Beck Depression Inventory score ($r = 0.342$, $p < 0.001$). The DWAS demonstrated robustness, reliability, and validity. This new scale is a suitable tool for assessing dementia worry levels among middle-aged and older adults in Japan. It may facilitate the development of tailored support for individuals with varying levels of dementia worry.

Keywords: anticipatory dementia, dementia worry, reliability, validity

INTRODUCTION

The older adult population is expanding rapidly, and as of 2024, Japan has the highest proportion of older adults worldwide.[1] In 2024, individuals aged 65 and over accounted for 29.3% of Japan's total population, placing Japan among 200 countries and regions with populations over

Received: November 10, 2025; Accepted: January 6, 2026
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100,000.[1] Given the anticipated decline in Japan's total population, projections indicate that the proportion of individuals aged 65 and older could reach approximately 39% by 2070.[2]

With the growing aging population, concerns about dementia are also increasing, drawing global attention to emotions such as worry and fear about developing the disease. In a US survey, 48.5% of respondents believed they were "very" or "somewhat" likely to develop dementia.[3] At the same time, a recent Australian study found that dementia was the second most feared disease after cancer.[4] The term "dementia worry" (DW) emerged around 2012 to conceptualize concerns about dementia onset, defined as "an emotional response to the threat of developing dementia in oneself."[5] Specifically, as dementia becomes more salient in daily life, individuals may begin to worry about the possibility of developing dementia. The prevalence of this phenomenon is expected to increase with rapid population aging. Given that Japan has one of the highest proportions of older adults in the world and actively promotes dementia awareness and education, this phenomenon is likely to be particularly prominent in the Japanese context.

Several scales assess DW's presence and intensity, employing multi-item constructs rather than single-item measures. For instance, the Fear of Alzheimer's Disease Scale (FADS)[6] includes 30 items categorized into three components: general fear, physical symptoms, and catastrophic attitude. The items of the FADS were generated through brainstorming with geropsychologists, other mental health professionals, and older adults regarding potential fears associated with developing Alzheimer's disease. The scale emphasizes both symptoms and the anxiety they elicit. The Dementia Worry Scale,[7] with 12 items, conceptualizes DW as a form of health anxiety, which differs from the FADS. Conversely, these scale developments have largely been conducted in Western countries with different cultures and systems. The conceptualization of DW lacks uniformity, making it challenging to develop standardized assessment tools.[8] Therefore, future development—particularly in Asia, where cultural backgrounds differ—requires careful consideration of DW's defining elements when establishing criteria for its assessment.

Beliefs and attitudes toward dementia may differ by country and ethnicity,[9,10] Low et al[10] investigated perceptions, attitudes, and beliefs about dementia among Italian, Greek, and Chinese minority groups as well as third-generation Australians. They found that minority groups tended to hold more negative attitudes toward dementia and suggested that the frequency of English media use and the degree of intercultural interaction may influence these attitudes. Additionally, a study examining the structure of social representations of dementia among the general population in the UK, the US, and China revealed that the US group emphasized care facilities. In contrast, the Chinese group placed greater emphasis on family-related aspects.[11]

International comparisons, including Japan, have shown that, compared with other countries, caregivers of persons with dementia in Japan experience lighter caregiving burdens, and institutionalization rates are higher.[12] Moreover, attitudes toward persons with dementia and ageism in Japan have been reported to be more positive,[13] highlighting differences in perceptions of dementia between Japan and other countries. These findings suggest that emotional responses to the onset of dementia may also vary across countries and ethnic groups. Therefore, assessment methods that take into account cultural and social contexts may be necessary. Thus, culturally relevant assessment methods may be necessary. Currently, no studies in Japan have utilized the concept of DW, and no culturally appropriate constructs or scales have been established for the Japanese context. Nonetheless, age-related diseases like dementia are a significant concern for many Japanese[14]; middle-aged and older adults in Japan commonly experience negative emotions—such as "fear," "apprehension," "threat," and "denial"—about the possibility of developing dementia.[15] Intense or frequent experiences of these emotions can disrupt daily life. Therefore, this study aimed to develop the Dementia Worry Assessment Scale (DWAS) for middle-aged and older adults in Japan and examine its reliability and validity.

MATERIALS AND METHODS

Study design

This cross-sectional study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for reporting standards.

Drafting the DWAS

The preliminary version of the DW scale in this study was developed based on the definition of DW proposed by Kessler et al,[5] who described DW as comprising overlapping affective components (eg, fear) and cognitive components (eg, associations, thoughts, and images) related to the perceived threat of developing dementia. In developing the item pool for the present scale, we incorporated affective components such as fear, concern, anxiety, and perceived threat, as identified in a Japanese survey,[15] along with cognitive components reflecting associations or images linked to dementia, including "losing memory," "not recognizing family members," and "losing one's autonomy."

Additionally, Kessler et al characterized DW as a hybrid concept combining elements of aging anxiety and health anxiety. Although it may be particularly salient among older adults, the phenomenon can also occur in adults, as it involves strong concerns about specific illnesses and heightened focus on declines in memory or identity. In developing the present scale, we ensured that the items were distinguishable from general aging or health anxiety and that the scale would apply to both adults and older adults.

Next, the draft DWAS was developed with reference to the consensus-based standards for the selection of health measurement instruments (COSMIN) guidelines.[16] Questionnaire items were selected, and the draft scale was created based on a literature review conducted during an expert panel meeting. The panel comprised five researchers, all of whom were nurses, including professors and associate professors at universities, with specialized knowledge of dementia. Among them were two researchers experienced in studying emotions related to dementia onset and several researchers who had experience listening to middle-aged and older adults living in communities in Japan discuss their thoughts and feelings about the possibility of developing dementia. In addition, one researcher had experience in scale development. Furthermore, a nurse proficient in English and knowledgeable about dementia was included on the panel.

The FADS[6] and the Fear of Dementia (FOD) scales[17] were key references for item development. Additionally, item selection was based on Japanese middle-aged and older adults' insights into dementia-related emotions.[15] The FADS, comprising 30 items, evaluates three components: general fear (based on memory self-perception), physical symptoms (linked to fear of Alzheimer's onset), and catastrophic attitudes (pessimistic perspectives on dementia). The FOD measures concerns across three domains: burden and loss, quality of life, and perceived social and cognitive loss. Additionally, the wording of items related to emotional responses to dementia onset, perceived impacts of dementia, and risk perceptions of developing dementia was carefully reviewed and selected by the researchers, with reference to insights from Japanese middle-aged and older adults regarding emotions related to dementia onset.[15]

Furthermore, content validity was evaluated by including individuals outside of the research team, including nurses with experience listening to middle-aged and older adults through qualitative inquiries, to assess whether the items were appropriately worded, non-overlapping, and comprehensively covered the construct of DW. Based on feedback such as items being difficult to understand, predicates being unclear, or instructions needing to be more specific for easier responses, revisions were repeatedly made. This process ensured the face validity of all items for the review members. Ultimately, a total of 30 items were selected. This included 12

items on "reactions to thinking about developing dementia," 11 items on "when to worry about developing dementia," and seven items on "fear of dementia."

Following the development and selection of items based on the preliminary DW scale described above, respondents were asked to indicate the frequency with which each item applied to them. Responses were recorded on a five-point Likert scale: 0 (none), 1 (rarely), 2 (sometimes), 3 (often), and 4 (always). Higher scores indicate a greater degree of DW, and the scale was designed to be applicable for both adults and older adults.

Participants and setting

The inclusion criteria were as follows: (1) adults aged 40 years or older; (2) residence in Prefecture X, Japan; and (3) ability to complete the questionnaire independently. The exclusion criteria were self-reported cognitive impairment and inability to complete the questionnaire independently. Participants were recruited through a representative of a residents' association in one district, who was asked to distribute 235 copies of the study information and questionnaire to residents without self-reported cognitive impairment. Using the research description, the representative provided an oral explanation to the residents when handing out the questionnaires. A pre-addressed return envelope was included with each questionnaire, and participants were asked to return it within approximately two weeks. A total of 182 participants (77.4% response rate) provided informed consent and submitted the questionnaires. From this pool, 152 respondents (83.5% valid response rate) with no draft scale missing were included in the analysis. Data were collected from August 2021 to February 2022. The questionnaires were self-administered, unsigned, and returned by mail using the pre-addressed envelope provided by the researchers.

Sample size

The initial version of the scale included 30 items. Based on the commonly used guideline of at least five participants per item for exploratory factor analysis (EFA),[18,19] the required sample size for analysis was set at 150 participants. To account for potential missing or unusable responses and assuming an expected response rate of approximately 65%, questionnaires were distributed to about 230 participants. This approach ensured that the planned number of analyzable responses was likely to be achieved.

Research content

The sociodemographic variables considered included age, sex, educational level (highest level attained), occupational status, household composition (family members living together), and current or past history of depression. Responses to the 30 draft DWAS items were recorded on a five-point Likert scale. For the assessment of construct validity, the Beck Depression Inventory–II (BDI-II),[20] a single-item measure assessing the level of concern about developing dementia, and the Japanese version of the Ten Item Personality Inventory (TIPI-J; used with permission from the original developers)[21] were administered.

Data analysis

Data analysis was conducted using Statistical Product and Service Solutions for Windows version 29.0.1.0 (IBM). Descriptive statistics summarized participants' demographics, with the significance level set at 5% (two-tailed). The Kolmogorov-Smirnov test assessed data normality. Sample size adequacy was carefully reviewed for each statistical method utilized. Data quality checks included examining missing values and outliers. Additionally, the mean and median were reviewed to assess the plausibility of the data distribution, and all responses were verified to fall within the valid range of the predefined response scales.

Item analysis

Item analysis was conducted to assess reliability. The items displaying ceiling or floor effects were excluded. Correlation coefficients for item-total (I-T) correlations and inter-item correlations were calculated, and I-T correlations below 0.3 were excluded. Items with inter-item correlations above 0.7 were evaluated for exclusion based on redundancy and the importance of item content.

Factor analysis

EFA using maximum likelihood with varimax rotation was performed to assess construct validity. The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity confirmed the appropriateness of the factor analysis. Factor extraction was guided by eigenvalues over 1 and the scree plot. Items with loadings below 0.4 were excluded.

Internal consistency and reliability analysis

Internal consistency and reliability were measured utilizing Cronbach's alpha for the total scale and for each factor, with high alpha coefficients indicating strong reliability.

Construct validity

Construct validity was examined using a hypothesis-testing approach through correlations with depression and the level of concern about developing dementia, because no established Japanese-language scale directly measuring DW was available at the time of this study. DW has been linked to adverse well-being indicators, including depression.[7,22] Among these indicators, depression has most frequently been examined as a psychological correlate in previous DW scale development studies. To assess depression, the BDI-II,[20] which has been validated for Japanese populations,[23] was administered. The BDI-II is a 21-item self-administered questionnaire, with each item scored from 0 to 3; higher total scores indicate greater severity of depressive symptoms. In this study, BDI-II scores were treated as continuous variables, and no cutoff values were applied. The participants rated their concern about developing dementia on a four-point Likert scale, using the question, "How concerned are you about developing dementia?", with scores of 1 (not at all concerned), 2 (not very concerned), 3 (somewhat concerned), and 4 (very concerned). Additionally, personality traits theoretically unrelated to DW, specifically conscientiousness and openness, were measured using the TIPI-J[21] to examine divergent validity. These traits were selected because they are theoretically unrelated to concern about developing dementia, allowing us to verify that the DW scale does not strongly correlate with unrelated constructs. The TIPI-J was chosen as a brief, validated, self-administered measure of the Big Five personality traits, making it suitable for inclusion in a larger questionnaire without overburdening participants.

Ethical considerations

The participants received written information about the study's purpose and voluntary nature. They signed an informed consent form. No identifying information was collected, and ethical approval was granted by Bioethics Review Committee of Nagoya University Graduate School of Medicine and Hospital. (approval number, 2021-0100-3).

RESULTS

Sociodemographic characteristics

Table 1 presents the sociodemographic characteristics of the participants, whose ages ranged from 41 to 83 years, with a mean age and standard deviation of 59.4 ± 10.9 years. Among the

Table 1 Participants' demographic data

Variable			Mean (SD)	n	(%)
Age	(n = 141)		59.4 (10.9)		
		40–49		31	22.0
		50–59		41	29.1
		60–69		39	27.7
		70–79		25	17.7
		80 and above		5	3.5
Sex	(n = 142)	Men		41	28.9
		Women		101	71.1
Educational level	(n = 142)	Below junior high school		5	3.5
		High school		24	16.9
		Vocational school		25	17.6
		Junior college		26	18.3
		University		53	37.3
		Graduate school		9	6.3
Occupation status	(n = 142)	Employed		103	72.5
		Unemployed		39	27.5
Living with family	(n = 142)	Yes		116	81.7
		No		26	18.3
Depression (current or past history)[a]	(n = 138)	Yes		15	10.9
		No		123	89.1
BDI-II	(n = 143)		10.2 (7.7)		
The level of concern about developing dementia	(n = 152)	Not at all concerned		5	3.3
		Not very concerned		29	19.1
		Somewhat concerned		81	53.3
		Very concerned		37	24.3
TIPI-J	(n = 142)	Conscientiousness	4.3 (1.3)		
	(n = 141)	Openness to experience	4.2 (1.3)		

SD: standard deviation
BDI-II: Beck Depression Inventory–II
TIPI-J: Japanese version of Ten Item Personality Inventory
"n" is the value without the missing values.
a: Current or past history of depression was self-reported.

participants, 41 (28.9%) were men, and 101 (71.1%) were women. Five participants (3.5%) had the lowest educational attainment level: elementary or junior high school. In contrast, high school, vocational school, and junior college had a fairly equal representation (16–18%). University education was the most common level, with 53 participants (37.3%), followed by graduate school, with 9 participants (6.3%). Employment data indicated that 103 participants (72.5%) were employed in some capacity. Additionally, 116 participants (81.7%) reported living with family members.

With respect to mental health–related characteristics, 15 participants (10.9%) reported a current or past history of depression. The mean BDI-II score was 10.2 ± 7.7. Regarding concern about developing dementia, more than half of the participants reported some degree of concern, with 37 participants (24.3%) indicating that they were very concerned and 81 participants (53.3%) indicating that they were somewhat concerned. For personality traits measured using the TIPI-J, the mean conscientiousness and openness to experience scores were 4.3 ± 1.3 and 4.2 ± 1.3, respectively.

Item analysis

Ceiling and floor effects. The draft DWAS was evaluated for ceiling and floor effects across its 30 items. Each item had a minimum score of 0 and a maximum score of 4. One item was excluded because its mean plus standard deviation exceeded the maximum score, and 12 items were excluded because their mean minus standard deviation fell below the minimum score.

I-T and inter-item correlations. Table 2 displays the distribution of responses, I-T correlations, and inter-item correlations for the remaining 17 items. Mean scores for these items ranged from 1.01 to 2.44. Each item showed a significant positive correlation with the total score, with correlation coefficients ranging from 0.228 to 0.836. One item (No. 4), which had an I-T correlation of 0.30 or lower, was removed from the draft scale. The remaining 16 items all demonstrated significant positive inter-item correlations, with a range of 0.334 to 0.885. Items with inter-item correlations of 0.70 or higher were reviewed, but no similar items were identified for exclusion.

Table 2 Item-total correlation and inter-item correlation

No	Item	Mean	SD	Skewness	Kurtosis	I-T correlation	Inter-item correlation	
							Min	Max
1	I am concerned about developing dementia.	1.38	1.12	0.85	0.26	0.599	0.337	0.706
2	I am terrified of developing dementia.	1.33	1.19	0.66	–0.34	0.709	0.423	0.847
3	I have anxiety about developing dementia.	1.20	1.09	0.80	0.12	0.707	0.423	0.847
4	I try not to think about developing dementia.	1.42	1.33	0.57	–0.76	0.228	—	—
5	When I forget things repeatedly, I am worried that I might develop dementia.	1.08	1.01	0.91	0.62	0.648	0.374	0.845
6	When it is hard to remember something, I am worried that I might develop dementia.	1.09	0.99	0.82	0.45	0.632	0.343	0.842
7	When I misplace something, I am worried that I might develop dementia.	1.01	0.95	0.92	0.69	0.629	0.334	0.842
8	When I hear about someone with dementia, I am worried that I might develop dementia.	1.07	1.03	0.92	0.62	0.661	0.412	0.659

9	When I become aware of my own physical decline due to aging, I am worried that I might develop dementia.	1.20	0.96	0.72	0.41	0.687	0.423	0.739
10	When the symptoms I am concerned about appear, I am worried that I might develop dementia.	1.09	1.06	0.82	0.12	0.713	0.477	0.739
11	When I have dementia, I am afraid of losing my memories.	1.72	1.36	0.32	–1.09	0.831	0.418	0.863
12	When I have dementia, I am afraid that I will not be able to recognize my family.	1.78	1.36	0.27	–1.09	0.757	0.337	0.863
13	When I have dementia, I am afraid that I will lose my will.	1.77	1.43	0.24	–1.24	0.836	0.387	0.841
14	When I have dementia, I am afraid of becoming a burden for others.	2.44	1.32	–0.35	–1.00	0.693	0.334	0.733
15	When I have dementia, I am afraid that I will not be able to share facts with others.	1.67	1.39	0.34	–1.12	0.774	0.406	0.839
16	When I have dementia, I am afraid that I will lose everything.	1.61	1.47	0.40	–1.23	0.827	0.384	0.885
17	When I have dementia, I am afraid of becoming like the living dead.	1.57	1.51	0.39	–1.31	0.761	0.343	0.885

SD: standard deviation
I-T: item-total
Item no. 4 was deleted based on I-T correlations, resulting in 16 accepted items.

Factor analysis

EFA was conducted on the 16 items selected through item analysis. The KMO measure of sampling adequacy was 0.924, and the Bartlett test of sphericity produced a $\chi^2 = 2561.43$ (df = 120, $p < 0.001$), confirming the suitability of the data for factor analysis. All items met the factor loadings criteria, and the results are summarized in Table 3. Two factors were extracted. Factor 1 ("Threat from having dementia"): This factor included seven items that expressed fears regarding the impacts of dementia onset, such as "When I have dementia, I am afraid that I will lose everything" and "When I have dementia, I am afraid that I would lose my will." Factor 2 ("Apprehension about developing dementia"): This factor included nine items reflecting anticipatory anxiety and perceived risk, such as "When it is hard to remember something, I am worried that I might develop dementia" and "I am concerned about developing dementia." Items with factor loadings of 0.35 or higher on both factors (Items 1, 2, 3, and 10) were reviewed by the researchers. Although these items showed cross-loadings, they were retained because their item–total correlations ranged from 0.599 to 0.713, well above the commonly accepted threshold of 0.30. Removing them did not improve the reliability of the subscales. Furthermore, the content

of these items was theoretically consistent with the construct being measured, supporting their inclusion. Specifically, these items represent core aspects of the construct that are conceptually relevant across both factors, and excluding them would have reduced the content validity of the scale. Factors 1 and 2 exhibited a significant positive correlation ($r = 0.645$, $p < 0.001$), with factor contribution rates of 36.06% and 33.69%, respectively. The internal consistency reliability for the entire scale (16 items) was $\alpha = 0.952$, with $\alpha = 0.956$ for Factor 1 and $\alpha = 0.940$ for Factor 2.

Table 3 Factor analysis summary

Factor	Item	Factor loading		Cronbach's α
		Factor 1	Factor 2	
Threat from having dementia				0.956
	When I have dementia, I am afraid that I will lose everything.	**0.89**	0.25	
	When I have dementia, I am afraid that I will lose my will.	**0.88**	0.29	
	When I have dementia, I am afraid of losing my memories.	**0.84**	0.34	
	When I have dementia, I am afraid that I will not be able to share facts with others.	**0.83**	0.28	
	When I have dementia, I am afraid of becoming like the living dead.	**0.83**	0.23	
	When I have dementia, I am afraid that I will not be able to recognize my family.	**0.78**	0.30	
	When I have dementia, I am afraid of becoming a burden for others.	**0.70**	0.28	
Apprehension about developing dementia				0.940
	When it is hard to remember something, I am worried that I might develop dementia.	0.16	**0.93**	
	When I forget things repeatedly, I am worried that I might develop dementia.	0.18	**0.91**	
	When I misplace something, I am worried that I might develop dementia.	0.23	**0.85**	
	When I become aware of my own physical decline due to aging, I am worried that I might develop dementia.	0.32	**0.70**	
	When the symptoms I am concerned about appear, I am worried that I might develop dementia.	0.36	**0.70**	
	When I hear about someone with dementia, I am worried that I might develop dementia.	0.32	**0.69**	
	I have anxiety about developing dementia.	0.48	**0.58**	
	I am concerned about developing dementia.	0.37	**0.57**	
	I am terrified of developing dementia.	0.48	**0.55**	
Total items				0.952
	Factor contribution ratio (%)	36.06	33.69	
	Inter-factor correlation Factor 1	1.000		
	Factor 2	0.645**	1.000	

** $p < 0.001$.

Construct validity

Table 4 exhibits the correlations between the DWAS score and the external criteria. Statistically significant positive correlations were found between the DWAS total score and the Japanese BDI-II score ($r = 0.389$, $p < 0.001$) and the level of concern about one's own development of dementia ($r = 0.630$, $p < 0.001$), supporting the convergent validity of the scale. Divergent validity was evaluated using personality traits theoretically unrelated to DW, specifically conscientiousness and openness, measured by the TIPI-J. The correlations between DWAS total scores and these personality traits were not statistically significant ($r = –0.136$ and $r = –0.056$, respectively), supporting the discriminant validity of the DWAS.

Table 4 Correlation between the DWAS score and external criteria

External criteria	Total score	Factor 1 score	Factor 2 score
BDI-II	0.389**	0.299**	0.443**
The level of concern about developing dementia	0.630**	0.514**	0.660**
TIPI-J, Conscientiousness	–0.136	–0.091	–0.153
TIPI-J, Openness to experience	–0.056	–0.074	0.006

DWAS: Dementia Worry Assessment Scale
BDI-II: Beck Depression Inventory–II
TIPI-J: Japanese version of Ten Item Personality Inventory
** $p < 0.001$.

Associations between demographic characteristics and DWAS total scores

Table 5 presents the associations between demographic characteristics and the DWAS total score. No statistically significant associations were found between age, educational level, occupational status, or living with family and the DWAS total score. Men and women had mean DWAS scores of 18.3 ± 13.9 and 24.8 ± 15.0, respectively, with women showing a statistically significantly higher mean score ($p = 0.017$). In addition, the mean DWAS score was 31.1 ± 16.7 among participants with a current or past history of depression, compared with 21.6 ± 14.6 among those without such a history. Although the DWAS score tended to be higher among participants with depression, this difference was not statistically significant ($p = 0.054$).

Table 5 Associations between demographic characteristics and DWAS total scores

Variable			DWAS score Mean (SD)	Correlation coefficient	*P* value
Age	(n = 141)			–0.087	0.303
		40–49	24.1 (13.0)		0.653
		50–59	25.1 (16.5)		
		60–69	21.7 (15.4)		
		70–79	20.8 (14.9)		
		80 and above	19.2 (11.9)		
Sex	(n = 142)	Men	18.3 (13.9)		0.017
		Women	24.8 (15.0)		

Educational level	(n = 142)	Below junior high school	14.2 (8.7)	0.254
		High school	21.3 (15.5)	
		Vocational school	28.6 (14.0)	
		Junior college	21.0 (14.0)	
		University	22.6 (16.1)	
		Graduate school	24.3 (12.0)	
Occupation status	(n = 142)	Employed	23.3 (14.3)	0.331
		Unemployed	21.9 (16.8)	
Living with family	(n = 142)	Yes	22.8 (15.0)	0.576
		No	23.8 (15.1)	
Depression (current or past history)[a]	(n = 138)	Yes	31.1 (16.7)	0.054
		No	21.6 (14.6)	

DWAS: Dementia Worry Assessment Scale

[a] Current or past history of depression was self–reported.

DISCUSSION

The primary aim of this study was to develop a DWAS specifically tailored to the sociocultural and linguistic context of middle-aged and older adults in Japan, and to evaluate its reliability and validity. The resulting DWAS comprises 16 items, providing a straightforward, practical tool that minimizes respondent burden across age groups. The scale items were developed based on existing tools measuring dementia-related fear, incorporating expressions that resonate with common negative emotions toward developing dementia in Japan, enhancing the DWAS's cultural relevance and linguistic suitability. Moreover, the scale was developed based on Kessler et al's definition and conceptualization of DW,[5] which aligns with the context of Japan's rapidly aging population. As a result, items such as "When I hear about someone with dementia, I am worried that I might develop dementia," "When I become aware of my own physical decline due to aging, I am worried that I might develop dementia," and "When the symptoms I am concerned about appear, I am worried that I might develop dementia" were selected, producing a scale that reflects the intended focus of our development process.

The DWAS includes two key factors: "Threat from having dementia" and "Apprehension about developing dementia." The Cronbach's alpha coefficient exceeded 0.9 for both the overall scale and each factor, confirming strong internal consistency. Similar levels of internal consistency have been reported in other language versions of similar scales,[6,7] with Cronbach's alpha values of 0.91 and 0.94, suggesting that the high reliability observed in the present study is consistent with previous findings. However, very high alpha coefficients may also indicate potential redundancy among items; therefore, further studies examining item reduction are warranted. Additionally, all items exhibited I-T correlation coefficients of approximately 0.6 or higher, further establishing the DWAS's reliability. Although some items exhibited skewed distributions (skewness > 1), they showed sufficient item–total correlations and factor loadings, supporting the reliability and construct validity of the scale. This pattern is common in Likert-type items and does not necessarily compromise scale development.

Kessler et al[5] suggested that individual differences in DW are influenced by (1) perceptions of being at risk of dementia, (2) perceptions about the consequences of developing dementia,

and (3) perceived coping resources for preventing and managing dementia. The "Threat from having dementia" factor in the DWAS aligns with perceptions of the consequences of developing dementia, while the "Apprehension about developing dementia" factor reflects concerns regarding perceived risk. In this context, the DWAS captures two core dimensions of DW, grounded in prior conceptual frameworks. Unlike existing scales that emphasize emotional fear and accompanying somatic symptoms, or conceptualize DW as a form of health anxiety (eg, the FADS and the Dementia Worry Scale), the DWAS focuses on more cognitive aspects, such as individuals' appraisals of the anticipated consequences of dementia and their perceptions of the likelihood of developing the condition. This focus may be particularly relevant in populations in which concerns about future loss of autonomy or functional decline strongly shape dementia-related worry.

Moreover, a qualitative study in Japan reported that middle-aged and older adults' emotions regarding their own potential dementia onset include negative feelings such as "fear."[15] Consistent with this, items such as "I have anxiety about developing dementia" and "I am terrified of developing dementia" were selected for the scale, reflecting the Japanese context. These two factors thus effectively capture the DW construct and demonstrate a robust framework for assessing individual differences in DW.

Prior reviews indicate that psychological factors such as distress, depression, and anxiety are strongly associated with DW.[8] The DWAS's significant correlation with BDI-II scores supports the external validity in relation to these factors. A slightly weaker correlation with anxiety measures has also been reported for the FADS,[6] which is considered a similar finding. Additionally, the moderate positive correlation between the DWAS and individuals' concern about developing dementia suggests that higher DWAS scores likely reflect greater perceived emotions such as threat and anxiety related to dementia onset.

Given that DW is a relatively new concept, research on its associated factors is still emerging, with existing scales undergoing revisions to enhance item relevance and reliability.[24] The DWAS developed in this study represents an initial step in assessing perceptions, psychological reactions, and emotional responses to dementia onset within Japan's sociocultural framework. Although dementia currently lacks a cure, early diagnosis has been shown to slow its progression. Research suggests an association between DW and an individual's willingness to undergo dementia screening, potentially facilitating early diagnosis.[25] Assessment of DW by the DWAS may be useful for nursing interventions aimed at early dementia screening.

Assessment results can inform interventions. For example, individuals who score high on perceived threat related to the consequences of dementia may benefit from realistic and supportive information about living with dementia. In contrast, those with elevated apprehension regarding the risk of developing dementia may be more responsive to accurate information about risk factors and preventive strategies, as well as interventions that address anxiety. Thus, the DWAS may provide a foundation for considering differentiated support strategies tailored to the nature of dementia-related worry.

Kessler et al[5] have proposed that longitudinal studies are essential for understanding the potential impact of DW on self-regulation, developmental outcomes, and indicators of successful aging, such as well-being and social engagement. The DWAS developed in this study could enable longitudinal tracking of DW, offering insights into potential interventions that promote a positive aging society.

Limitations and future research

This study's sample was limited to a single prefecture in Japan, potentially limiting the generalizability of the findings due to sociodemographic variability. Future studies should include broader, more diverse samples to enhance the generalizability of the results. In addition, confirm-

ing the cross-validity of the scale using independent samples from other prefectures, as well as comparisons with DW scales in other languages, would further strengthen the psychometric robustness and cross-cultural applicability of the scale. Once the psychometric properties of the scale are sufficiently established, further consideration of cutoff values and potential applications may be warranted. Another limitation is the absence of a test-retest method, which would confirm the stability of participants' responses over time. Future research should expand the study's scope and settings to further validate the DWAS's reliability and validity. Moreover, as this scale relies on subjective self-assessment, it would be beneficial to incorporate objective measures for a more comprehensive evaluation of DW.

CONCLUSIONS

The DWAS was developed to measure Japanese middle-aged and older adults' emotional responses regarding the perceived threat of dementia onset. It comprises two factors—"Threat from having dementia" (7 items) and "Apprehension about developing dementia" (9 items)—for a total of 16 items. Its validity and reliability have been confirmed, although additional refinement and evaluation are warranted. This scale provides a means to assess the subjective level of DW in middle-aged and older adults, enabling tailored support based on DW levels. Moreover, investigating factors that influence DW could inform the development of targeted support strategies, fostering better preparedness and coping mechanisms among this population.

CONFLICT OF INTEREST STATEMENT

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

FUNDING

This work was supported by Japan Society for the Promotion of Science (JSPS) KAKENHI under grant (number JP19K11275).

ACKNOWLEDGMENTS

The authors would like to thank the participants for their involvement in this study. We would like to thank Editage (www.editage.jp) for its English language editing services.

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