



# Validity of the Korean Version of the Fear of Alzheimer's Disease Scale for the Assessment of Anticipatory Dementia

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Anticipatory dementia is related to anxiety, which is a clinical predictor of early conversion to Alzheimer's disease. The Fear of Alzheimer's Disease Scale (FADS) is a reliable and valid instrument to address anticipatory dementia. The aim of the present investigation was to develop the Korean version of the Fear of Alzheimer's Disease Scale (K-FADS) and to verify its reliability and validity. We developed the K-FADS to consist of 30 items with total scores ranging from 0 to 120, as in the original FADS. One hundred eight healthy volunteer participants, drawn from 3 different university hospitals, were evaluated. The K-FADS revealed good reliability (Cronbach  $\alpha = 0.96$ ) and good validity as compared to the Korean version of the State-Trait Anxiety Inventory Form ( $r = 0.242$ ,  $P = 0.013$ ). Test-retest reliability was excellent, as the intra-class correlation coefficient comparing the retest to test was 0.98 (95% confidence interval, 0.96-0.99). Our results show that the K-FADS is a suitable and valuable scale to assess anticipatory dementia in elderly Koreans.

**Keywords:** Alzheimer Disease; Anticipatory Dementia; Scale; Anxiety; Cognitive Impairment; Korea

## INTRODUCTION

As Alzheimer's disease (AD) becomes of increasing interest to the general population, concerns over developing dementia or AD also increase. Anticipatory dementia is the basic fear that memory problems experienced because of normal aging are instead an indication of dementia. Anticipatory dementia is mixed manifestations of psychiatric symptoms (mostly expressed as fear or anxiety), physical response, vulnerable attitude, and concerns toward AD. This manifestation could be a consequence from person's own situation such as a proximity to dementia, but also from prodromal symptoms of AD. Many studies have reported that anxiety is linked to anticipatory dementia (1-3), and is a clinical predictor of earlier conversion to AD (3). However, there is lack of validated, well-constructed measurement scales to assess anticipatory dementia (1). The Fear of Alzheimer's Disease Scale (FADS) is one reliable and valid instrument to assess anticipatory dementia. FADS is a 30-item self-report measure to assess 1) basic questions; 2) loss of memory; 3) physical symptoms of fear/anxiety; 4) vegetative symptoms of fear/anxiety; 5) catastrophic attitude towards AD; and 6) family-related concerns/loss of autonomy. In the initial development of the FADS, a three-factor model of General Fear, Physical Symptoms, and Catastrophic Attitude was constructed by accounted factor loadings. The Cronbach  $\alpha$  value, which was calculated to

evaluate the reliability of the entire assessment, was 0.94, indicating good internal consistency. In addition, the FADS was strongly correlated with the level of anxiety. No suggested cutoff was provided for predicting anticipatory dementia (1).

The aim of the present investigation was to develop the Korean version of the FADS (K-FADS) and to verify its reliability and validity.

## MATERIALS AND METHODS

### Development of K-FADS

The forward translation of the original FADS was made by a bilingual translator whose mother tongue is Korean. Back translation was provided by 2 translators who were not aware of any information regarding the concepts or medical background of the study. In the first draft translation, all members of the committee, which consisted of 4 neurologists and 2 neuropsychologists, provided translations. These were reviewed, and the pre-final version of the questionnaire was selected based on these translations. The pre-final version of K-FADS was initially administered to 10 volunteers, after which it was finalized on the basis of survey outcomes. The second translation committee reviewed the pre-test results and consolidated the final version of K-FADS.

The methods of administration and scoring of the K-FADS

were similar to procedures used for the FADS. The participants were asked to indicate their degree of concurrence using a five-item Likert-type scale: never; rarely; sometimes; often; or always. The minimum score of 0 was equated to "never," and the maximum score was 4 for each statement. The final version consisted of a 30-item self-report measure, with total scores ranging from 0 to 120, as in the original version of FADS.

### Study participants

Evaluation was based on 108 volunteers drawn from 3 different university hospitals. The Memory Clinic and Health Care Center of Konkuk University Medical Center, Hanyang University Medical Center in Seoul and Guri were involved. Physically independent healthy volunteers aged between 60 and 90 yr, and without subjective or objective cognitive complaints, were recruited. Participants who were illiterate, or who were previously diagnosed with dementia or a psychiatric disease, including depressive disorder or schizophrenia, were excluded.

Information about age, sex, years of education, proximity to dementia (cohabit with dementia patient or family history of AD, or no family history of AD), living conditions (live with cohabitant or live alone), and number of comorbidities including hypertension, diabetes mellitus, hyperlipidemia, and cardiovascular disease were also obtained to analyze response differences by these sociodemographic characteristics.

Experienced neurologists conducted medical examinations to reveal the presence of dementia and excluded participants with focal neurological signs.

### Procedures

The K-FADS was administered first and foremost to void the effect of other cognitive measurements. Thereafter, the mini-mental state examination (MMSE) was applied to evaluate cognitive decline. After a screening test for cognitive decline, the State-Trait Anxiety Inventory-Form (STAI) was assessed to obtain the validity of the K-FADS. The STAI is a scale designed to measure anxiety in normal subjects (4). The Korean version of the STAI (K-STAI) is the most commonly used instrument for this purpose in Korea. The K-STAI consists of 2 sections measuring state anxiety (state-A) and trait anxiety (trait-A). Each section includes 20 statements with a four-item Likert-type measurement scale: not at all; almost never; almost always; very much so. The K-STAI has demonstrated inter-rater and test-retest reliability, sensitivity and concurrent validity with other instruments (5).

As the inclusion criteria was independent and healthy volunteers without cognitive declines, three participants who scored under two standard deviation of MMSE were excluded.

Twenty participants were randomly selected from the Konkuk University Medical Center to determine the inter-rater reliability of the measurements. The selected participants performed the retest 3 months after the first test.

### Statistical analysis

Means, standard deviations, and percentages were used to describe the sociodemographic and neuropsychiatric characteristics. Factor structure was assessed using confirmatory factor analysis. The recommended factor loadings needed to get 80% power at a significance level of  $P < 0.05$  is 0.60 (6). Reliability was assessed by internal consistency, inter-rater reliability, and test-retest reliability. For internal consistency, the Cronbach  $\alpha$  reliability coefficient was used. Coefficients needed to achieve excellent and good internal consistency were  $\alpha > 0.9$  and  $0.7 < \alpha < 0.9$ , respectively (7). Intra-class correlation coefficients (ICC) were calculated for inter-rater reliability and test-retest reliability. An ICC between 0.6 and 0.8 is considered a good clinical correlation, and an ICC greater than 0.8 is deemed an excellent correlation. To evaluate concurrent validity, the K-FADS was compared with the K-STAI by using Pearson's correlation coefficient.

Age, sex, years of education, proximity to dementia (cohabitation with dementia patient, family history of AD, or no family history of AD), living conditions (live with cohabitant or live alone), and number of comorbidities, including hypertension, diabetes mellitus, hyperlipidemia, and cardiovascular disease, were used as factors that could affect the participant's fear of AD. The associations between age, years of education, and K-FADS scores were generated using simple regression analysis. Between-group comparisons were performed using the Mann-Whitney U test and Kruskal-Wallis test. Statistical analyses were performed with SPSS 18.0, and the level of statistical significance was set at  $P < 0.05$ .

### Ethics statement

All participants provided written informed consent regarding the use of their clinical data for research purposes. The study was approved by the institutional review boards of the Konkuk and Hanyang University Medical Centers (IRB No. KUH1170060).

## RESULTS

### Demographic and neuropsychiatric characteristics

The mean age of the participants was 68.2 (range, 60 to 87) yr. Females were dominant ( $n = 76$ , 70.4%) and the majority of participants ( $n = 82$ , 75.9%) did not have a family history of dementia. Relatively little participants lived alone ( $n = 14$ , 13.0%). Almost all participants had more than one disease ( $n = 107$ , 99.1%). The additional sociodemographic data are presented in Table 1.

### Factor structure

Factor analysis showed that the K-FADS is composed of 3 factors, termed General Fear, Physical Symptoms, and Catastrophic Attitude in the original FADS. Factor loadings of each statement are presented in Table 2. Three of the 30 statements (items

**Table 1.** Sociodemographics and neuropsychiatric characteristics

Category	Mean (SD)	Range
Age (yr)	68.2 (6.1)	60-87
Education (yr)	8.7 (5.0)	1-18
Female (No., %)	76	70.4
Proximity to Alzheimer's disease		
Cohabit with dementia patient (No., %)	20	18.5
Family history of Alzheimer's disease (No., %)	6	5.6
No family history of Alzheimer's disease (No., %)	82	75.9
Living alone (No., %)	14	13.0
Numbers of comorbidities		
0 (No., %)	1	0.9
1 (No., %)	10	9.3
2 (No., %)	24	22.2
3 (No., %)	38	35.2
4 (No., %)	35	32.4

SD, standard deviation.

**Table 2.** K-FADS factor loadings

	Factor 1	Factor 2	Factor 3
K-FADS item 01	0.658	0.432	0.112
K-FADS item 02	0.695	0.451	0.086
K-FADS item 03	0.808	0.196	0.021
K-FADS item 04	0.755	0.438	-0.041
K-FADS item 05	0.613	0.050	0.032
K-FADS item 06	0.647	0.412	0.119
K-FADS item 07	0.701	0.081	0.221
K-FADS item 08	0.704	0.529	-0.030
K-FADS item 09	0.686	0.556	0.098
K-FADS item 10	0.754	0.451	0.157
K-FADS item 11	0.633	0.581	0.107
K-FADS item 12	0.661	0.548	0.161
K-FADS item 13	0.438	0.836	0.135
K-FADS item 14	0.483	0.833	0.116
K-FADS item 15	0.410	0.795	0.183
K-FADS item 16	0.647	0.473	0.375
K-FADS item 17	0.522	0.604	0.295
K-FADS item 18	0.202	0.136	0.817
K-FADS item 19	0.306	0.249	0.613
K-FADS item 20	0.156	0.101	0.819
K-FADS item 21	0.046	0.143	0.925
K-FADS item 22	-0.005	0.166	0.945
K-FADS item 23	0.090	0.095	0.837
K-FADS item 24	0.086	0.165	0.843
K-FADS item 25	0.053	0.110	0.905
K-FADS item 26	0.177	0.442	0.123
K-FADS item 27	0.188	0.630	0.103
K-FADS item 28	0.195	0.573	0.116
K-FADS item 29	0.106	0.540	0.126
K-FADS item 30	0.249	0.734	0.113

K-FADS, Korean version of the Fear of Alzheimer's Disease Scale.

26, 28, and 29) fell below the recommended level of 0.60.

**Reliability**

The internal consistency was excellent. The Cronbach  $\alpha$  for all 30 statements of the K-FADS was 0.96, and factors 1, 2, and 3 showed  $\alpha$  values of 0.96, 0.93, and 0.95, respectively. After re-

**Table 3.** Pearson's correlations among K-FADS, state-A, trait-A and K-STAI

	State-A	Trait-A	K-STAI
K-FADS	0.086	0.326*	0.242*
State-A		0.507 <sup>†</sup>	0.862 <sup>†</sup>
Trait-A			0.874 <sup>†</sup>

\* $P < 0.05$  level of significance, <sup>†</sup> $P < 0.001$  level of significance. K-FADS, Korean version of the Fear of Alzheimer's Disease Scale.

**Table 4.** Group response to K-FADS

Category		R <sup>2</sup>	P value
Age (yr)		0.003	0.590
Education (yr)		0.044	0.029
	Subcategory (No.)	Mean (SD)	P value
Sex	Male (n = 32)	33.4 (26.2)	0.706
	Female (n = 76)	35.3 (25.2)	
Proximity	Cohabit with dementia patient (n = 20)	32.1 (26.8)	0.849
	Family history of Alzheimer's disease (n = 6)	39.0 (24.1)	
	No family history of Alzheimer's disease (n = 82)	36.3 (25.8)	
Living conditions	Cohabitant (n = 94)	34.7 (25.6)	0.847
	Living alone (n = 14)	35.2 (25.3)	
Number of comorbidities	0-1 (n = 11)	32.8 (31.7)	0.769
	2 (n = 24)	39.0 (24.2)	
	3 (n = 38)	34.0 (24.6)	
	4 (n = 35)	33.3 (25.7)	

K-FADS, Korean version of the Fear of Alzheimer's Disease Scale; SD, standard deviation.

moving the 3 statements which fell below the factor loadings of 0.60, the Cronbach  $\alpha$  for the other 27 statements of the K-FADS was 0.96, and factors 1, 2, and 3 had  $\alpha$  values of 0.96, 0.94, and 0.95, respectively. However, we determined that deleting the 3 statements is unnecessary, since there was a minimal improvement in internal consistency only in factor 2, without increased reliability of the entire K-FADS. Test-retest reliability was excellent, as the ICC comparing the retest to test was 0.98 (95% confidence interval [CI], 0.45-0.82).

**Validity**

Concurrent validity was good, as the correlations between the K-FADS and K-STAI were significant (Pearson correlation coefficient [ $r$ ] = 0.242,  $P = 0.013$ ). No correlation was observed between the state-A and K-FADS ( $r = 0.086$ ,  $P = 0.376$ ), while trait-A revealed a significant correlation with the K-FADS ( $r = 0.326$ ,  $P = 0.001$ ) (Table 3).

**Group responses**

There was no effect of age ( $r^2 = 0.003$ ,  $P = 0.590$ ) on the K-FADS, otherwise, the years of education had positive correlation with the K-FADS ( $r^2 = 0.044$ ,  $P = 0.029$ ). There was no difference of the K-FADS between groups defined by the other sociodemographic characteristics including sex, proximity to dementia, living conditions, and numbers of comorbidities (Table 4).

## DISCUSSION

The present study indicates that the K-FADS is a reliable and valid scale to quantify anticipatory dementia. The factor loadings showed great internal consistency of structure, which can be summed up by 3 factors. The three factors, named as the General Fear, Physical Symptoms, and Catastrophic Attitude in the original FADS could be apply to the K-FADS, as well. In reliability study, the K-FADS revealed better reliability (Cronbach  $\alpha = 0.96$ ) than the original FADS study (Cronbach  $\alpha = 0.94$ ). Deleting the 3 statements which fell below the factor loading 0.60 was unnecessary, because the procedure only improve the Cronbach  $\alpha$  of factors 2 from 0.93 to 0.94, otherwise make the participants feel the entire structure is incomplete. In validity study, there was a good correlation between the K-FADS and K-STAI. As expected, trait-A revealed a significant correlation with the K-FADS ( $r = 0.326$ ,  $P = 0.001$ ), which was in contrast with the state-A ( $r = 0.086$ ,  $P = 0.376$ ). Therefore, it is expected that the K-FADS would demonstrate that anticipatory dementia is strongly correlated with the level of anxiety (1).

The analysis of group responses of the K-FADS showed interesting results in which age, sex, proximity to dementia, living conditions, and numbers of comorbidities are not related to anticipatory dementia. Previous studies that investigated the relationship between sociodemographic variables and the personal concerns of the general population towards AD revealed that the elderly, women and those with proximity to AD (being a caregiver or having a family history of AD) have more fear of developing AD (8, 9). Among these factors, aging makes the person feel helpless and have a loss of self-regard, which could aggravate memory problems (10). The person's own experiences of AD could also make them perceive AD more seriously. Sex is not an independent factor, but is one of the proximity indicators to AD, as women often care for parents with dementia (11).

In contrast with results from French population, who identified a greater fear among low level of education (8, 9), our findings showed that participants with the high level of education had more fear of AD. The high self-esteem, which is thought that the well-educated people have more than illiterate, may aggravate the fear even with episodic memory problems.

Our study showed that age and proximity to AD did not affect anticipatory dementia as stated in the original FADS (1). Our finding of this distant relation can be interpreted in several ways. First, the diversity of previous results may be attributed to significant variations in the assessment methods, selection of patients, and duration of follow-up used in each study. Most previous studies used a single question (i.e., Are you worry for being demented?) to evaluate the fear of AD (12-14) As mentioned earlier, the K-FADS is a well-structured scale which could assess the anticipatory dementia consisting of multiple statements. The use of quantified scores by multiple well-construct-

ed statements of the K-FADS is different to the use of a simple question, and enables the meticulous evaluation of anticipatory dementia. A more precisely specified diagnosis of anticipatory dementia could lead to more meaningful results. Second, the K-FADS is intended for the general population without cognitive complaints. Unlike our study using the K-FADS, most previous studies were conducted with patients experiencing cognitive decline. Third, it suggested that the K-FADS has the power to be used regardless of sociodemographic characteristics. Lastly, our finding could be a result of the statistical limitation by lack of sufficient number to analysis.

Anticipatory dementia is different from simple fear of AD. Anticipatory dementia is mixed presentations of psychiatric symptoms (mostly expressed as fear or anxiety), physical response or signs, catastrophic attitude, and concerns toward AD. Specifically, the concerns always include the complaints of subjective memory impairment. Although objective neuropsychiatric results showed normal profile, some people still complain some ominous sense and are distressed about AD. We do not know whether the anticipatory dementia is a real pathologic symptom or not. Maybe it could be peoples' own anxiety which affected by proximity to dementia. Some research has failed to prove an association between anxiety and mild cognitive impairment (15, 16). However, previous reports showed that anxiety is related to the future development of AD in persons with and without mild cognitive impairment (2), and anticipatory anxiety is a useful clinical marker of earlier conversion to AD (3). In Korean study, anxiety was one of the most common psychiatric symptoms of mild cognitive impairment and early AD (17, 18). Because there is lack of study about the prodromal psychiatric symptoms or anticipatory dementia, we think this validation study could the fundamental study for future research.

The present study has small sample size ( $n = 108$ ), and applies the same scale to the elderly as is applied to the general population. The assessment of anxiety in the elderly is complex and has methodological issues (19). However, the reliability and validity was adequate to prove the viability of this method, and in any case, age did not affect the K-FADS. As this study is conducted using cross-sectional methodology, further longitudinal studies are required to ascertain the relation between anticipatory dementia and early cognitive impairment.

In summary, this study revealed that the K-FADS is a suitable and valuable scale to assess anticipatory dementia in elderly Koreans.

## DISCLOSURE

The authors report no conflicts of interest and have nothing to disclose.

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