

ORIGINAL ARTICLE

Development and testing of the Attitude Scale for the Dietary Therapy of Hemodialysis Patients

Hiromi ONBE and Kiyoko KANDA

Graduate School of Health Sciences, University of Gunma, Maebashi, Japan

Abstract

Aim: To develop an attitude scale regarding the dietary therapy of hemodialysis patients and to examine its reliability and validity.

Methods: An initial item pool of 37 items was extracted from a conceptual model that had been developed in the authors' previous study and the literature was reviewed. An expert panel examined the content validity. A total of 381 Japanese hemodialysis patients then were recruited. Exploratory factor analyses and a confirmatory factor analysis were used to test the construct validity and an item analysis, internal consistency coefficients, and test–retest were used to verify the reliability.

Results: The expert panel judged the content validity index to be satisfactory. The data from the final 16 items consisted of three factors (propensity of behavior that is affected by cognition, propensity of behavior that is affected by the food culture, and negative affect that modifies the diet). Regarding the subscales, the Cronbach's coefficient alpha values were confirmed to be reliable, showing medium-to-high internal consistency. The test–retest method confirmed the stability of the scale.

Conclusion: With the reliability and validity confirmed, it was established that the Attitude Scale for the Dietary Therapy of Hemodialysis Patients described herein is capable of determining the attitude of hemodialysis patients towards their dietary therapy. This scale makes it possible to quantitatively evaluate hemodialysis patients' attitudes toward dietary therapy. The accuracy of the scale needs to be improved by further examining its reliability and validity.

Key words: attitude, dietary therapy, renal dialysis, scale development.

INTRODUCTION

The number of dialysis patients had increased worldwide by 13-fold in the 30 years prior to 2010 (Nakai *et al.*, 2010) and remains on the rise. The number of dialysis patients undergoing long-term maintenance dialysis treatment in Japan totaled 320,448 at the end of 2014 (Masakene *et al.*, 2016). The average duration of dialysis in Japan is 8.76 years, the longest among the 19 leading nations of the world in dialysis therapy. It shows a good prognosis (Arbor Research Collaborative

for Health, 2010). However, the dietary therapy for hemodialysis patients tends to be more demanding than that of patients with diabetes or chronic cardiac disease. Hemodialysis patients, therefore, cannot easily enjoy their meals and their quality of life tends to fall.

Dialysis patients are put under strict dietary restrictions that conflict with the enjoyment of eating. Continuing to enjoy eating, even when undergoing dietary therapy, is important to help the patients endure what is a restrictive therapy for a long period of time. However, to be able to maintain proper dietary therapy for an extended period, it is also important to have extensive knowledge of what it entails. Therefore, when developing education programs, nurses should not simply draw up a suitable dietary program, but also should pay attention to the relationship between affect, such as

Correspondence: Hiromi Onbe, Faculty of Nursing, Graduate School of Health Sciences, University of Gunma, 3-39-22 Showa, Maebashi, Gunma 371-8514, Japan.
Email: sanaki@gunma-u.ac.jp

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pleasure, and have the knowledge that is needed to help with behavior modification.

In patient education, to enhance behavioral changes, the necessary knowledge and a desirable attitude must be acquired (Kim, Reicks, & Sjoberg, 2003). “Attitude” is, in social psychology, understood to have three components: affect; cognition; and propensity of behavior (Rosenberg & Hovland, 1960). Affect is regarded as the most important. Cognition and affect both influence human behavior. Therefore, the authors considered that the key to behavior formation in patients’ dietary therapy is to build attitude, which is influenced by affect and cognition. This led to the conclusion that, in dietary therapy education for hemodialysis patients, an understanding on the part of nurses as to cognition and affect, which influence patients’ attitudes, can lead to effective behavioral changes in patients. The development of a scale that enables the quantitative measurement of attitude is necessary in order to achieve this goal.

Research on cognition as part of dialysis patients’ dietary therapy includes studies on education programs for hemodialysis and continuous ambulatory peritoneal dialysis (CAPD) patients (Chow & Dalton, 2012; Sutton, Higgins, & Stevens, 2007). These program interventions were directed at the cognition of hemodialysis patients by providing them with information on how to reduce their phosphorus concentration and at the cognition of CAPD patients by providing advice on how to achieve the recommended levels. Although there were no changes in the test results, the results of the study verified improvements at the level of behavior and cognition. There hitherto has been no research on affect in hemodialysis patients’ dietary therapy: studies on affect and cognition in areas other than hemodialysis include investigations of low- and high-carbohydrate weight-loss diets, low and high glycemic-load, low-energy diets, mood, and the behavioral effects of a Mediterranean diet (Brinkworth, Buckley, Noakes, Clifton, & Wilson, 2009; Cheatham *et al.*, 2009; D’Anci, Watts, Kanarek, & Taylor, 2009; Halyburton *et al.*, 2007; McMillan, Owen, Kras, & Scholey, 2011). It was found that these diets influence mood, but not cognition, suggesting that dialysis patients’ dietary therapy might have a stronger effect on affect. Scales of mood and cognition, such as the Profile of Mood States and on working memory, are those that measure general mood and cognition, but not affect and cognition that are specifically related to diet therapy. As such, there hitherto has been no research that quantitatively measures scale development by demonstrating the relationship with affect and

cognition, both of which influence attitude in relation to hemodialysis patients’ dietary therapy. Furthermore, no attitude scale in relation to the dietary therapy of hemodialysis patients has been developed in previous research, although there is a scale that can be used to assess attitudes to compliance with water restrictions and dietary therapy conditions in hemodialysis patients. In addition, there has been no research on affect, cognition, or propensity of behavior, all of which affect dialysis patients’ attitude to dietary therapy. One scale that is available for hemodialysis patients is for measuring compliance to dietary restrictions, including food and fluids (Rushe & McBee, 1998). This is a scale of attitude to adherence. The authors want to determine the attitude to dietary therapy in this study. Namely, the intention is not to develop a scale of adherence attitude to see if a patient is positively involved in dietary therapy. Rather, it was attempted to develop an attitude scale to measure affect, cognition, and propensity of behavior toward dietary therapy. This is the point that differs from other scales that have been developed in previous studies. Another scale of attitudes to dietary therapy has been developed in order to test eating attitudes, based on clinical conditions such as the eating attitudes and eating behaviors that are specific to patients with anorexia nervosa. Although both the reliability and validity of this scale have been confirmed, it cannot be regarded as an appropriate scale for hemodialysis patients who do not have any mental disorder, as it includes questions about “vomiting after eating” and other irrelevant items (Mukai, Kambara, & Sasaki, 1998). For this reason, the two scales are not capable of assessing affect, cognition, or propensity of behavior that might influence the attitude of hemodialysis patients toward dietary therapy.

Therefore, a qualitative study was conducted by using ethnographic techniques on nine dialysis patients and eight of their family members in order to clarify the themes of affect, cognition, and propensity of behavior that influence hemodialysis patients’ attitudes to dietary therapy (Onbe, 2014; Onbe & Kanda, 2014; Onbe *et al.*, 2013). A thematic analysis revealed four core themes: affect, cognition, propensity of behavior, and culture, within which eight themes were identified. Therefore, it was thought that it was important to develop a scale in this study that includes food culture, in addition to affect, cognition, and propensity of behavior.

The aim of this study was to create the Attitude Scale for the Dietary Therapy of Hemodialysis Patients (ASDTH) for Japanese hemodialysis patients concerning

their dietary therapy and to examine its reliability and validity.

Conceptual framework

It was found that culture influences each component of affect, cognition, and propensity of behavior. Therefore, a conceptual framework was constructed as a conceptual model in which food culture influences each of the three components. The conceptual framework of attitudes toward the dietary therapy of the hemodialysis patient is represented in Figure 1, based on a review of previous research and literature. It is a conceptual model that is based on cultural anthropology and social psychology that looks at attitude as affected by four components: affect, cognition, propensity of behavior, and food culture. Based on this conceptual framework, a scale was developed and analyzed for its reliability and validity.

Culture is a concept of constructed semantic structures and customs that are acquired over the history of a society or group. Therefore, “food culture” was defined as a constructed behavior and culinary customs, as seen through the history of that country. For this reason, the concept of culture is designated as “food culture” in this study.

METHODS

Study design

This is a methodological investigation with a non-experimental design, formulated for scale development. The scale was prepared in the Japanese language and its development involved a number of steps, including item generation, content validity testing, exploratory factor

analysis (EFA), confirmatory factor analysis (CFA), validity testing, and reliability testing.

Creation of an item pool

For each of the four core themes that constitute the sub-scale, 4–20 items were created, making 37 items in total. During the process of selecting the 37 items, nine nursing experts in chronic disease with a minimum of a Master’s degree were requested to verify the proposed items. They were asked to examine whether the items suitably and thoroughly reflected the concepts that were to be measured. The items then were further sorted and the expressions were refined. From these steps, 20 items were selected concerning propensity of behavior, four concerning cognition, eight concerning affect, and five concerning food culture in order to form 37 items on the scale.

Participants

Four dialysis centers in two prefectures in Japan were selected. A total of 785 hemodialysis patients were recruited in the survey through convenience sampling in the period from May to August 2013. The number of samples, 785, was determined by following the sample size calculation method of Faul, Erdfelder, Lang, and Buchner (2006). The eligibility criteria were the following: (i) the participants had received hemodialysis therapy for at least 6 months; (ii) they were aged from 20 years to 80 years; (iii) they were fluent in spoken and written Japanese; and (iv) they had not been diagnosed with dementia and/or higher brain dysfunction.

Table 1 shows a summary of the research participants and a clinical overview. The number of collected responses was 513 (64.9%), of which 381 (74.3%) were valid responses that were subjected to the analysis, excluding those with one or more omissions or that were clearly outliers. The participants were 381 chronic maintenance dialysis patients in total, 236 male and 145 female, aged 27–79 years, with a mean age of 62.6 ± 10.4 years. The participants had been on dialysis for an average of 8.80 ± 6.9 years.

Instruments

Demographic data and clinical data

The items regarding the demographic data included the participants’ age and employment status and who was in charge of food preparation at home.

The clinical data regarding the serum phosphorus, serum calcium, serum potassium, dialysis duration, and mean monthly weight gain (with 2 days in between)

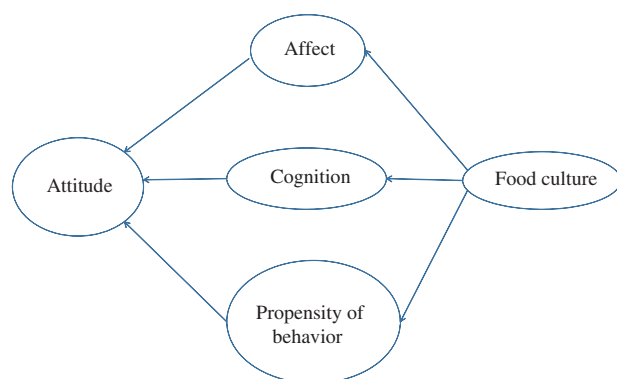


Figure 1 Conceptual framework.

Table 1 Demographic and clinical data of the participants ($n = 381$)

Characteristic	Mean \pm SD or N (%)
Age (years)	62.60 \pm 10.47
Dialysis duration (years)	8.80 \pm 6.90
Serum phosphorus (mg/dL)	5.09 \pm 1.11
Serum potassium (mEq/L)	4.84 \pm 0.71
Serum calcium (mg/dL)	8.65 \pm 0.67
Mean monthly weight gain (%)	4.57 \pm 1.59
Sex	
Male	236 (61.9)
Female	145 (38.1)
Employment status ($n = 367$)	
Unemployed	269 (73.3)
Employed	98 (26.7)
In charge of food preparation ($n = 362$)	
Oneself	140 (38.7)
Family	205 (56.6)
Home delivery	4 (1.1)
Others	13 (3.6)

SD, standard deviation.

were collected from the participants' medical records with the consent of the patient and the head of the facility.

Attitude Scale for the Dietary Therapy of Hemodialysis Patients

Prior to the EFA, it was checked whether or not floor and ceiling effects existed. Although these effects were found in 14 items, they were all minor. Therefore, it was decided to use all 37 items in the analysis.

The ASDTH is to be used for assessing the multifaceted attitudes (affect, cognition, propensity of behavior, and food culture) of hemodialysis patients toward their dietary therapy. This scale consists of 37 items on four subscales: "propensity of behavior," "cognition," "affect," and "food culture." The answers are given on a 4-point Likert-type scale, where 1 indicates "strongly agree" and 4 indicates "strongly disagree." The scores are calculated by the subscale: the higher the score, the stronger the concept. Regarding the subscale of affect, because negative affect (NA) also was considered as eustress during dietary therapy (Onbe, 2014), higher scores were regarded as indicating better attitudes. The authors' qualitative research revealed that it is important for dialysis patients to undergo eustress in order to be able to change their attitudes towards their dietary therapy (Onbe, 2014). Patients

can behave well and say, "I try not to take in too much protein and phosphorus" in Factor 1, even if they have negative emotions in Factor 3. Eustress acts as a deterrent that helps the participants not to overeat. For example, "I love fruit. I'll have just a little bit. Just a few nibbles, shouldn't overdo it ..." The authors therefore think that it is important to have a positive attitude. This entails not experiencing the stress that is caused by forbidding oneself to eat certain items, but eustressing by enjoying the process of eating only a little of one's favorite foods.

Before the study, the content validity was evaluated by using a content validity index (CVI). The CVI was calculated by using a four-point ordinal rating scale that ranged from 1 ("not relevant") to 4 ("quite relevant"). The items that earned a CVI rating of three or four from a certain proportion of experts were included in the scale. Polit and Beck (2004) recommend 0.80 as the acceptable lower limit for the CVI score. The results that were obtained from the four experts, nursing researchers, and dialysis nurses revealed the calculated value of the final CVI to be 0.90, confirming the validity of the attitude scale. The four-subscale, 37 item scale therefore was used in the main study.

Verification of the criterion-related validity: Critical Thinking Disposition scale

Critical thinking can be placed into two separate domains: the cognitive domain, such as skills and abilities, and the emotional domain, such as attitudes and leanings (Ennis, 1987). Developed by Hirayama and Kusumi (2004), the Critical Thinking Disposition scale is used to assess the emotional component of critical thinking. This scale was used to test the criterion-related validity of the ASDTH. One of its subscales, "cognition," also is linked to emotional aspects, such as attitudes and leanings, rather than the purely cognitive aspects, such as skills and abilities. Therefore, it was hypothesized that the subscale of cognition in the ASDTH would show a positive correlation with the Critical Thinking Disposition scale; more specifically, "awareness of the importance of logical thinking," "an inquiring outlook," "objectivity," and "evidence-based judgment." The Critical Thinking Disposition scale consists of a 10 item "awareness of the importance of logical thinking" subscale, a 10 item "an inquiring outlook" subscale, a five-item "objectivity" subscale, and a three-item "evidence-based judgment" subscale. The answers are presented on a 5-point Likert-type scale. Higher scores reflect a stronger tendency in the

subscales. The Cronbach's alpha reliability was 0.85 for "awareness of the importance of logical thinking," 0.82 for "an inquiring outlook," 0.72 for "objectivity," and 0.57 for "evidence-based judgment." Concerning the validity of the Critical Thinking Disposition scale, the criterion-related validity was examined in comparison with patterns of thought and personality characteristics, which have been confirmed to be correlated with performance in critical thinking assignments.

Verification of the criterion-related validity: the Japanese version of the Positive and Negative Affect Schedule scale

There are two opinions on the basic dimensions of affect: that "pleasant" and "unpleasant" are located on both ends of the same dimension; and that "pleasant" and "unpleasant" represent two independent dimensions (Russell, 1979). This shows that there exist two aspects of emotion; namely, positive and negative. The Japanese version of the Positive and Negative Affect Schedule (PANAS) scale is a simplified feeling evaluation scale that consists of eight positive affect (PA) items and eight negative affect (NA) items and was developed by Sato and Yasuda (2001). The Japanese version of the PANAS scale was used as one of the external criteria to assess the validity of the ASDTH. In the ASDTH, the subscale of affect is composed of NAs and PAs. Therefore, it was hypothesized that the affect subscale of the ASDTH should show a positive correlation with PA and a negative correlation with NA. The Japanese version of the PANAS scale is capable of evaluating current feelings, while calculating the total scores of both the PA and NA subscales. The higher the score, the stronger the emotion. The Cronbach's alpha reliability was 0.83 for PA and 0.91 for NA. The test-retest reliability estimates were 0.83 for the PA subscales and 0.82 for the NA subscales. The Japanese version of the PANAS scale was validated to be appropriate for determining the PA subscales and NA subscales by tests of feelings.

Ethical considerations

This study was approved by Gunma University's Clinical Ethics Examination Committee (Approval no. 12-72). This study underwent screening by, and received the authorization of, the Research Ethics Review Committee. It also followed the guidelines of the Helsinki Declaration. The researchers explained the study in writing and verbally to the potential participants and their consent was obtained after the

researchers explained the aim of the study and informed them of the protection of their privacy and data, the voluntary nature of participation in the study, any benefits and disadvantages, and the right to withdraw from the study at any time without any detriment.

Data collection

The researchers or hospital personnel explained to the patients the ethical considerations and purpose of the research during their dialysis therapy. After the patient's consent had been obtained, he or she was handed a questionnaire. The questionnaires were collected on the same day or at a clinic revisit. In order to confirm reliability, the test-retest method was followed by conducting a retest 2 weeks after the first administration and collection of the questionnaire during a clinic revisit.

Data analysis

For analysis, SPSS v. 21.0 J for Windows (SPSS Japan, Tokyo, Japan) and Amos17 (SPSS Japan) were used. The item-total correlation for item analysis was analyzed. The Cronbach's alpha reliability and test-retest reliability were analyzed in order to calculate the correlation between the first and second questionnaires as a measure of reliability.

In order to verify the construct validity using the ASDTH, the data were analyzed by conducting an EFA. The EFA was conducted by the principal components extraction method with promax rotation using SPSS. The following criteria were used in order to determine the number of factors to retain a factor loading cut-off of 0.40 (Kaiser, 1960; Loewenthal, 2001).

The correlation coefficients were calculated in order to verify the criterion-related validity between the subscales of the ASDTH, the Critical Thinking Disposition scale, and PANAS.

A CFA can determine how well the proposed model fits the data. In this study, in order to use AMOS, a CFA was carried out to see whether the factor model that emerged from the EFA provided a good fit to the data. In order to determine the model fit, the following fit indices were used: the χ^2 -test, the relative χ^2 (CMIN/DF), the root mean square error of approximation (RMSEA), the comparative fit index (CFI), the normed fit index (NFI), the non-formed fit index (NNFI), and the incremental fit index (IFI) (Browne & Cudeck, 1993).

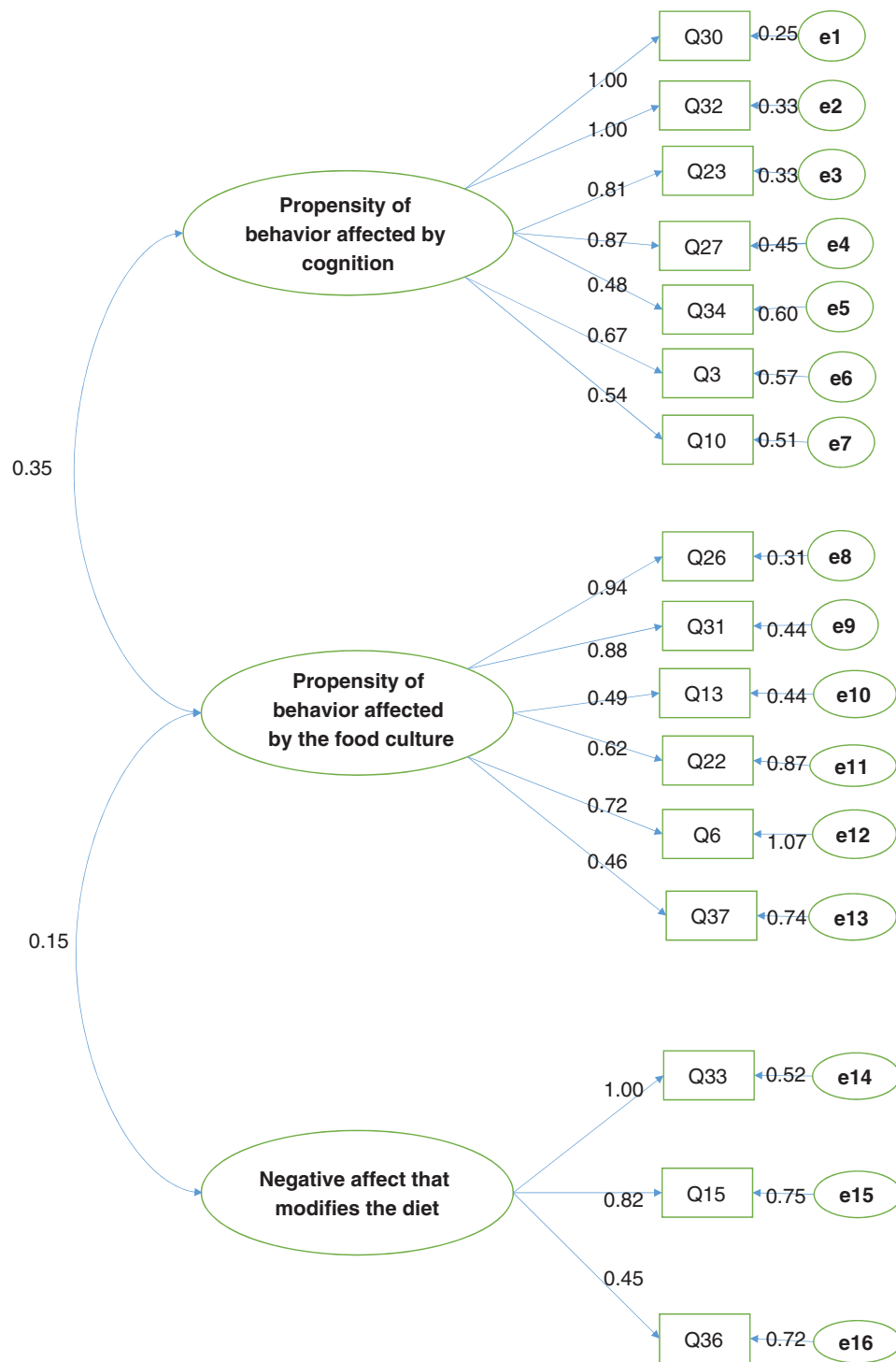


Figure 2 Confirmatory factor analysis model for the Attitude Scale for the Dietary Therapy of Hemodialysis Patients.

RESULTS

Item analysis

The item analysis revealed six items that indicated a low value of ≤ 0.2 . These negative items are all important in constructing a scale. Consequently, it was decided to consider taking a further look at the result of the construct validity and the Cronbach's alpha reliability.

Construct validity

Exploratory factor analysis

Using a factor analysis with a principal factor analysis of the 37 items, the scree plot and Eigenvalues were checked. A principal factor analysis, with promax rotation, then was applied in order to determine if this improved the solution. A three-factor solution was identified and 21 items that loaded below the level of 0.40 were deleted (Kaiser, 1960), resulting in the extraction of a stable three-factor solution with 16 items. Considering the result of the factor analysis and the number of conceptual frameworks, the number of factors was determined to be three. This explained 46.5% of the variance. The commonality after the factor extraction was ≥ 0.18 and the factor loadings were ≥ 0.43 . Although the cumulative contribution was slightly low, it was decided to use the 16 items for the final attitude scale (Table 2).

Of the three factors, Factor 1 was designated as “propensity of behavior affected by cognition” based on the selected seven items, including “I try to eat considering my conditions and symptoms to prevent complications.” Factor 2, which is composed of six items, such as “I try to eat meals that allow me to enjoy the season,” was designated as “propensity of behavior affected by food culture.” Finally, Factor 3 was designated as “negative affect that modifies the diet” based on three items, such as “Restrictions on foods and fluids give me distress.”

Confirmatory factor analysis

The hypothetical model's goodness-of-fit that was obtained in the EFA was examined by using a CFA. “Propensity of behavior affected by cognition” and “negative affect that modifies the diet” had no relationship with each other. Finally, the hypothetical model's goodness-of-fit was as follows: CMIN/DF = 2.61, RMSEA = 0.065, CFI = 0.87, NFI = 0.81, NNFI = 0.861, and IFI = 0.877. The path coefficient values that had been calculated from the latent variables to the

observable variables were all statistically significant ($P < 0.01$) (Fig. 2).

Criterion-related validity test

Correlation with the Critical Thinking Disposition scale

Pearson's correlation coefficients were calculated between the subscale of the ASDTH, “propensity of behavior affected by cognition” and those of the Critical Thinking Disposition scale, “awareness of the importance of logical thinking,” “an inquiring outlook,” “objectivity,” and “evidence-based judgment,” which turned out to be statistically significant, although the correlations were low ($r = 0.09$ – 0.24 , $P < 0.01$) (Table 3).

Correlation with the Japanese version of the Positive and Negative Affect Schedule scale

An analysis between the subscale, “negative affect that modifies the diet,” of the ASDTH and NA in the PANAS revealed a significant negative correlation, although the correlation coefficient was low ($r = 0.17$, $P < 0.01$) (Table 3).

Correlations among the three subscales

The correlations among the three subscales were analyzed by using the Pearson's correlation coefficient ($n = 381$). Significant correlations were confirmed among the subscales, except for “propensity of behavior affected by food culture” and “negative affect that modifies the diet” ($r = 0.26$ – 0.55 , $P < 0.01$) (Table 3).

Reliability test

Internal consistency coefficient

The Cronbach's alpha was calculated for the three subscales of the attitude scale ($n = 381$), providing confirmation of the reliability of the subscales, with high internal consistency ($\alpha = 0.62$ – 0.83) (Table 2).

Test-retest reliability

In terms of the three subscales of the attitude scale, Pearson's correlation coefficients were calculated between the first and second test results for the 74 participants who gave valid responses to both the main questionnaire and the retest 2 weeks later. A significant positive correlation of $r \geq 0.83$ ($P < 0.01$) was found concerning the “propensity of behavior affected by cognition” and the “propensity of behavior affected by food culture.” With regard to “negative affect that

Table 2 Exploratory factor analysis results and final items for the Attitude Scale for the Dietary Therapy of Hemodialysis Patients

	Item	Question	Factor loadings				Total alpha
			F1	F2	F3	Alpha	
Factor 1: Propensity of behavior affected by cognition	Q. 30	After starting dialysis, I have been utilizing the experience in how I eat	0.778			0.83	0.84
	Q. 32	I try to eat considering my conditions and symptoms to prevent complications	0.708				
	Q. 23	I try not to take in too much protein and phosphorus	0.698				
	Q. 27	I study diet therapy	0.588				
	Q. 34	I get knowledge and experience about dialysis from my medical treatment life at home	0.566				
	Q. 3	I pay attention to the quality and type of oil I take in	0.511				
	Q. 10	I gather health information from the medical staff	0.504				
	Q. 26	I try to eat meals that allow me to enjoy the season		0.842		0.78	
Factor 2: Propensity of behavior affected by the food culture	Q. 31	I try to eat meals that use locally grown foods		0.797			
	Q. 13	I try to eat meals that use seasonal foods		0.622			
	Q. 22	My family and/or friends eat meals with me that adhere to my dietary therapy		0.555			
	Q. 6	I have family and/or friends who cook meals for me that adhere to my dietary therapy		0.441			
	Q. 37	I try to eat meals with a lot of vegetables		0.411			
	Q. 33	R Restrictions on foods and fluids give me distress			0.678	0.62	
Factor 3: Negative affect that modifies the diet	Q. 15	R To tell the truth, I want to eat more than is allowed			0.606		
	Q. 36	R I am very sensitive to being thirsty			0.507		

Items marked with “R” are reverse-scored.

modifies the diet,” a negative correlation of $r = -0.81$ was shown ($P < 0.01$), indicating that the total scale and its dimensions were confirmed by the test–retest reliability method to be stable over time (Table 3).

DISCUSSION

Reliability

In this study, the reliability of the scale was studied from three aspects: item analysis, reliability through

internal consistency, and stability through a test–retest method. In terms of internal consistency, except for “negative affect that modifies the diet,” the other two subscales had a correlation coefficient of $\alpha \geq 0.78$. However, “negative affect that modifies the diet” had a low value, at $\alpha = 0.62$. It has been stated that if the number of items in a subscale is low, the reliability coefficient is also low (Streiner & Norman, 2008). It is therefore possible that the subscale of “negative affect that modifies the diet,” with only three items, was an

Table 3 Summary of the correlation coefficients, reliability, and validity

Scale for the Dietary Therapy of Hemodialysis Patients (ASDTH) (<i>n</i> = 381)		Factor 1	Factor 2	Factor 3
Correlations among the ASDTH subscales	Factor 1	1.000	0.554**	0.260**
	Factor 2	–	1.000	0.077
	Factor 3			1.000
Reliability	Test–retest reliability (<i>n</i> = 74)	0.835**	0.881**	–0.810**
Validity	Critical Thinking Disposition scale			
	Awareness of logical thinking	0.219**	0.168**	–0.040
	Inquiring mind	0.240**	0.126	–0.028
	Objectiveness	0.164**	0.095**	–0.012
	Evidence-based judgment	0.203**	0.031	0.163**
	Japanese version of the Positive and Negative Affect Schedule scale			
	Negative affect	0.128	–0.098	0.171**
	Positive affect	0.025	–0.006	0.170**

***P* = 0.01.

influencing factor. Also, the two items that showed low values in the item-total correlation belonged to “negative affect that modifies the diet,” which could indicate a low value for the reliability coefficient. For the future, with regard to the “affect toward meals” subscale, sub-items will be added to address the issue of raising the internal consistency. However, in relation to the test–retest reliability, a correlation was confirmed for the three subscales, confirming stability. For this reason, reliability was assured from the three analyses, although there was an issue with stability in terms of internal consistency.

Validity

When the attitude scale was created prior to the main study, its CVI was measured at >0.90, assuring the scale’s content validity. Later, a study was conducted using the temporary attitude scale. The four subscales from the core themes that had been clarified in the model that had been taken from the authors’ prior research were affect, cognition, propensity of behavior, and food culture. For this study, however, only three subscales were used. They then were reexamined from the conceptual framework of attitude, culturally influenced affect, cognition, and propensity of behavior. When reexamined from the perspective of attitude, the propensity of behavior had no independent presence, but it did have a presence in relation to affect, cognition, and food culture. Therefore, it was concluded that the three subscales that have been clarified in this study represent a valid result in light of the conceptual framework that was adopted. One reservation, however, is

that in the initial model, the “negative affect that modifies the diet” subscale was created to also include PAs, but that ultimately only NAs were left. The model that had been clarified from previous research was created from favorable test data that had been taken from patients who had achieved the desired dietary therapy and in whom PA had been demonstrated (Onbe *et al.*, 2013). However, it became clear from the results of this study that many of the dialysis patients harbored NA. As it can be difficult to collect quantitative data on affect, it is important to evaluate it through using interviews and other qualitative data conjointly and to reappraise the scale items.

Correlations regarding the subscales of the attitude scale support the authors’ hypothesis about the Critical Thinking Disposition scale and the Japanese version of the PANAS scale. The low correlation coefficient, however, makes it necessary to use criterion-related validity verification in order to examine the scale when modifying it. In this regard, it is believed that the subscales possessed criterion-related validity that was confirmed even when the correlation coefficients were low. As it also satisfied a certain standard of model fit in the CFA, it is concluded that this model can be clinically applied.

Limitation of the study

As to the limitations of the study, with regard to the affect subscale, for which internal consistency was insufficient, better reliability can lead to a higher quality and improvements in the scale. As representing affect quantitatively is difficult, additional follow-up

investigations are necessary by using a qualitative study to refine the affect subscales.

In addition, based on a close examination of previous research, the Critical Thinking Disposition scale that is used for verification of criterion-related validity and the Japanese version of the PANAS were not the scales that were used in this study. As the ASDTH has not been verified in previous research, it was not possible to examine the scale in order to confirm the criterion-related validity. This is seen as a limitation regarding the confirmation of the validity of the scale.

CONCLUSION

The attitude scale was composed of three subscales—“propensity of behavior affected by cognition,” “propensity of behavior affected by food culture,” and “negative affect that modifies the diet”—and 16 scale items (Tables A1, A2). The attitude scale showed some low values for reliability that was related to the internal consistency of the subscales, but a retest 2 weeks later confirmed its stability. Additionally, the criterion-related validity was confirmed between the three subscales and the Critical Thinking Disposition scale and the Japanese version of the PANAS scale. This indicates that the scale has the reliability and validity that are needed for a quantitative measurement of attitude in the special dietary therapy of patients undergoing chronic maintenance hemodialysis. As a number of challenges remain, there is room for future improvements that will make it possible to quantitatively study attitudes to dietary therapy and make the unseen visible. The use of this scale in patient education thus holds promise.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Both H. O. and K. K. were fully involved in the study's conception and design, data collection and analysis, and drafting of the manuscript.

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