

Reliability and Validity of the Korean version of the Pain in Older Adults Knowledge Survey (K-POAKS) among Nurses Who Have Worked in Long-term Care Hospitals

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Purpose: The purpose of this study was to verify the validity and reliability of the Korean version of the Pain in Older Adults Knowledge Survey (K-POAKS) to assess knowledge of pain in older adults including people with dementia for use in long-term care hospital nurses. **Methods:** Survey data were collected from a convenience sample of 179 nurses who have worked in long-term care hospitals in B, D and U cities. The Kuder-Richardson Formula 20 for internal consistency for test reliability was conducted. The content, criterion-related and construct validity were evaluated using SPSS/WIN 22.0. **Results:** The KR 20 was .75 and Content Validity Ratio (CVR) was a range of 0.84~1.00. The criterion-related validity was positively correlated with attitudes ($r=.28, p<.001$) and performance ($r=.21, p=.004$). The construct validity of K-POAKS was analyzed by conducting the principal component method using the exploratory factor analysis varimax rotation, and seven factors were derived above the eigenvalue of 1.0. The seven factors explained 58.5% of the total variation. **Conclusion:** The Korean version of the POAKS showed satisfactory internal reliability, content validity, criterion-related validity and construct validity. These results suggest that the K-POAKS could be used as a suitable tool to measure the knowledge of the aged people's pain, including that of dementia patients for long-term care hospital nurses.

Key Words: Aged; Pain; Reliability; Validity

INTRODUCTION

1. Background

In Korea, approximately 89.2% of the elderly population is reported to have one or more chronic diseases, and the majority of older adults report experiencing pain [1]. Elderly residents in long-term care hospitals and facilities suffer mainly from diseases which cause pain or require pain management, such as cerebrovascular disease, dementia, and cancer [2]. In addition, most older adults have musculoskeletal disorders, which are the most common cause of pain, and neurological disorders and recent fall experiences, urinary tract infections, pneumonia, and skin wounds are also reported as common causes of pain

in older adults [3,4]. Elderly residents in long-term care hospitals, including dementia patients, suffer from chronic illnesses or physiological degenerative conditions. Pain is one of the most common symptoms they experience during long hospital stays. Actually, in a previous study, more than 80% of patients in a long-term care hospital reported having pain, and the average pain intensity of the participants was rated as moderate or severe [5]. In particular, 66.7% of the non-dementia group and 63.2% of the dementia group reported pain [6], showing that a large proportion of older adults with dementia also report moderate to severe pain, contrary to general expectations.

However, due to the inadequate awareness about pain in older adults among older adults and healthcare workers, pain in older adults is not properly assessed and

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- This work was supported by research grants from Ulsan College in 2018.

Received: Feb 27, 2020 / Revised: May 6, 2020 / Accepted: May 11, 2020

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managed. In addition, although the levels of pain intensity in older adults with dementia are not much different from those of pain intensity in older adults without dementia, pain assessment and prescription of analgesics by medical staff have been reported to be significantly lower in older adults with dementia than in older adults without dementia [7]. Dementia patients experience a decline in linguistic expression ability and communication skills due to cognitive impairment, so it is difficult for medical staff to assess pain in dementia patients because they cannot express their pain adequately. This untreated pain leads to a decline in physical function, sleep disorders, reduced socialization, increased uses of medical services and an increase in medical costs, ultimately deteriorating the quality of life in older adults [4].

On the other hand, it has been found that older adults, including elderly dementia patients, tend to think of pain as a natural phenomenon due to aging, and are reluctant to report pain not to bother medical staff, and have fear about addiction to pain medication. Medical staff regard pain in older adults as a part of the aging process rather than a health problem, and think that dementia patients do not experience pain or cannot report it even when they experience it. Moreover, in some cases, medical staff are not aware that changes in the behavior of dementia patients can be signs of pain [8,9]. In addition, it has also been reported that medical staff have fear about administering narcotic analgesics to older people, show concerns about drug addiction and drug tolerance in older people, and lack confidence in implementing non-pharmacological pain management [10].

This lack of knowledge of medical staff about pain becomes a major obstacle to pain management, leading to inappropriate pain management [8]. Among healthcare workers, nurses are personnel who provide care for patients around the clock in the nearest position from them. For this reason, they need to be equipped with the competency to recognize pain and provide appropriate pain management. Nurses working in long-term care hospitals, where almost all patients are older adults, should implement pain management with accurate knowledge about pain in older adults, including those with dementia. Nurses without adequate knowledge about pain may not adequately recognize pain in patients, so patients' complaints of pain are ignored and not recorded, making it difficult to perform pain management, and even if pain assessment is performed, a lack of knowledge about pain management may lead to inappropriate pain management [9].

Therefore, for effective management of pain in older adults, nurses should have an adequate understanding of

the nature of pain in patients and accurate knowledge of pain assessment and management. A lack of knowledge limits healthcare workers' abilities to understand information related to diseases and perform treatment, leading to missing the appropriate timing for treatment [11]. Nurses should have knowledge about drug addiction and dependence, adverse drug reaction, pharmacological pain management, non-pharmacological pain management, and methods of measuring the effectiveness of pain management as well as knowledge about nonverbal cues of pain or signs and symptoms of pain in older people, including those with dementia [7]. To appropriately manage pain in older people, including those with dementia, it is necessary to accurately assess the knowledge levels of nurses and implement training to improve pain management. To do so, a measurement tool is needed to assess nurses' knowledge about pain assessment and management.

In Korea, there is an instrument developed to assess nurses' attitudes towards pain in patients with severe dementia [12], but there are no instruments developed in Korea or Korean-translated versions of instruments for assessing nurses' knowledge about pain in older adults, including dementia patients. In foreign countries, there are measurement tools developed to assess knowledge and attitudes [9] or knowledge and beliefs [13] regarding pain in dementia patients among nursing staff, including nurses working in nursing homes or to assess knowledge about pain in older adults among nurses working in hospitals and nursing homes [14]. However, these tools involve an ambiguous mixture of knowledge and attitudes or a mixture of knowledge and beliefs, and some aspects of them are not suitable for assessing knowledge alone. In addition, each of them was developed for a single author's own use, and the evaluation of the reliability and validity of the tools was not properly carried out. Therefore, Fetherstonhaugh et al. [7] developed the Pain in Older Adults Knowledge Survey (POAKS) to measure nurses' knowledge about pain in older adults, including dementia patients. This tool consists of items about the experience, assessment, and management of pain in older adults and the items were developed based on a review of research literature. With respect to the evaluation of the reliability and validity of the tool, 17 experts, including authors of guidelines or research papers regarding pain in older adults and elderly dementia patients, developers of existing pain assessment tools, and members of an international pain society, participated in the evaluation processes and established the reliability and validity of the POAKS through the three-round Delphi process, demonstrating that the POAKS is an appropriate tool for measuring knowledge about pain

in older adults.

Therefore, in this study, we aimed to develop the K-POAKS using the POAKS created by Fetherstonhaugh et al. [7] through translation, back-translation, reconciliation, and adaptation to create a tool suitable for Korean culture and to evaluate the reliability and validity of the K-POAKS through a survey among nurses of long-term care hospitals. An assessment tool developed through the instrumentation process described above is expected to provide basic data for the improvement of nurses' knowledge about pain in older adults and implementation of appropriate pain assessment and interventions.

2. Purpose

This study aimed to develop a Korean version of the Pain in Older Adults Knowledge Survey (K-POAKS) through translation, back-translation, reconciliation, and adaptation using the POAKS developed by Fetherstonhaugh et al. [7] to assess knowledge about pain in older adults including dementia patients among nursing staff working in nursing homes, and to evaluate the validity and reliability of the developed tool. The specific objectives of this study are as follows:

- To assess the internal reliability of the K-POAKS;
- to verify the content validity of the K-POAKS;
- to verify the criterion validity of the K-POAKS;
- to verify the construct validity of the K-POAKS.

METHODS

1. Study design

This study is a methodological study to develop a Korean version of the Pain in Older Adults Knowledge Survey (K-POAKS), a tool to assess knowledge about pain in older adults among nurses, and to verify the reliability and validity of the K-POAKS.

2. Participants

In this study, nurses working in long-term care hospitals across the country were the target population, but nurses working in long-term care hospitals located in B, P and U cities were selected as the accessible population and the participants were selected by the convenience sampling method. The inclusion criteria were long-term care hospital nurses with 3 months or more of work experience in long-term care hospitals and the experience of taking care of dementia patients with pain. The sample size was

determined based on the literature suggesting that the sample size for factor analysis should generally be 4 to 5 times the number of variables and that the sample size required for factor analysis is generally 100 to 200 [15,16]. Thus, a minimum of 120 samples were required in this study, which was 5 times the number of 24 items of the POAKS. A total of 195 participants were enrolled in the study, and the data of 179 people were finally included in the analysis, excluding 16 people because of missing data.

3. Procedures

1) Translation for the development of the K-POAKS and verification of content validity

After receiving approval for the use of the tool from Fetherstonhaugh et al. [7] who were the authors of the original version of the POAKS, translation and back-translation were conducted [17]. Translation was conducted by the researcher who previously conducted research on geriatric pain, two college professors in the nursing department who have a doctorate degree in nursing and specialize in pain management and nursing care for older adults at college, and a nursing major who was a native speaker of Korean and had worked as a nurse in an English-speaking country for over 20 years. After the initial translation, the revision of the translated version was conducted by selecting expressions acceptable to many people, focusing on the concepts while comparing translated versions with each other. In the next step, a nursing professor fluent in both English and Korean but not aware of the original tool was asked to translate the Korean-translated version back into English. After back-translation was completed, the researcher and translator together revised the translated version by reviewing the meaning of each item and differences between the back-translated version and the original version.

Verification of the content validity of the revised translated version was conducted by a group of experts in order to identify inappropriate expressions or concepts and increase the comprehensibility, clarity, and accuracy of the contents. The expert panel was composed of two professors of a college of nursing who specialize in pain management and nursing care of older adults, two nurses who specialize in the nursing care of older patients, two nurse managers of long-term care hospitals, and two neurologists treating patients with dementia. Using the content validity index (CVI) for the adequacy of the measurement tool, content validity was estimated based on Lynn's [18] method of computing CVIs. The experts were required to rate the validity of each item by assigning 4 points for

'highly relevant', 3 points for 'quite relevant', 2 points for 'somewhat relevant', and 1 point for 'not relevant at all', and the number of experts who gave 3 or 4 points was counted. The items with a CVI of less than 0.5 were considered to have no content validity. The items with a CVI of 0.8 or higher were considered to have high content validity [18].

2) Verification of reliability

A preliminary survey was conducted among 20 nurses in a long-term care hospital, a sample of the target population of the K-POAKS, and the KR-20 coefficient for reliability of the tool in the preliminary survey was .84, so the translated version of the tool was finalized. The K-POAKS consists of 24 items in total, and respondents are required to answer 'Yes', 'No', or 'Do not know.' Dummy variables, which are coded 0 or 1, are used and responses are scored by assigning 1 point for a correct answer and 0 points for an incorrect answer or 'Do not know'. Higher scores indicate higher levels of knowledge.

3) Verification of criterion validity

To verify criterion validity of a newly developed assessment tool, the relationship or the degree of correlation between the measurement results of a new tool and a standard tool is assessed, and a high correlation between them indicates that the new instrument has a high level of criterion validity [15]. To test the criterion validity of the K-POAKS, a tool for measuring attitudes towards pain management in dementia patients [19] and a tool for measuring performance of pain management in dementia patients [20] were used as the criteria. The tool used to assess attitudes towards pain management in dementia patients was an assessment tool for nurses of long-term care hospitals developed by Ryu and Park [19]. It consists of a total of 12 items, including 4 items for pain assessment and 8 items about pain interventions, and each item is rated on a 4-point scale. Total scores range from 12 to 48 points, and higher scores indicate more desirable attitudes. The tool to assess performance of pain management in dementia patients was developed by Lee and Park [20] to measure performance of pain management in dementia patients among nurses working in long-term care hospitals. It consists of a total of 35 items, including 12 items about pain assessment and 23 items about pain interventions, and each item is rated on a 5-point scale. Total scores range from 35 to 175 points, and higher scores indicate a higher level of performance of pain management in dementia patients.

4) Verification of construct validity

Construct validity indicates whether abstract constructs that a tool is designed to measure are appropriately measured by the tool, and it can be assessed by various statistical methods such as correlation, experimental design, and factor analysis [15]. In this study, factor analysis was used to assess the construct validity of the K-POAKS. In factor analysis, a factor loading is a correlation coefficient between each variable and a given factor. Factor loadings of ± 0.4 or above are considered significant, and factor loadings of ± 0.5 or above are considered highly significant. An eigenvalue, which is the sum of all squared factor loadings for a given factor, represents the total variance explained by each factor. A greater eigenvalue indicates greater explanatory power of the factor. If the eigenvalue is less than 1.0, it means that the factor cannot explain as much as even the variance of a variable, and the factor is considered insignificant [15]. If the contribution rate of each factor is used as the criterion, a factor is selected if its contribution rate is 5% or more. Therefore, in this study, factors with an eigenvalue of 1.0 or higher and a contribution rate of 5% or higher were selected.

4. Data Collection and Ethical Considerations

Data collection was carried out from February 10 to May 30, 2019, and this study was conducted after obtaining approval from the IRB of Ulsan College (UC2018009). To collect data, the researcher visited or called long-term care hospitals located in B, D, or U city and explained the purpose and procedures of the study to the head of the nursing department and requested cooperation for data collection. Then, questionnaires were delivered to the head of the nursing department of each hospital by personal visit or by mail. The questionnaires were distributed after receiving written informed consent from participants, and the participants were requested to complete the questionnaires immediately after receiving them and put completed questionnaires in the document envelopes placed at a designated place. The document envelopes with completed questionnaires were retrieved by the researcher or the head of the nursing department.

5. Statistical Analysis

The data of this study was analyzed using SPSS/WIN 22.0, and the reliability and validity of the K-POAKS were estimated.

First, in order to evaluate the reliability of the K-POAKS, internal consistency reliability was assessed using the Kuder-Richardson Formula 20 (KR-20) coefficient. In addi-

tion, the ‘ α if item deleted’ value, which indicates what the Cronbach’s α value will be if a measurement item is deleted, was computed, and corrected item-total correlation (ITC) was also calculated.

Second, to assess the content validity of the K-POAKS, the content validity index (CVI) was calculated by a group of experts.

Third, to evaluate criterion-related validity, Pearson’s correlation coefficient was used to determine the degree of correlation between the K-POAKS and the tool for assessing attitudes toward pain management in dementia patients and between the K-POAKS and the tool for assessing performance of pain management in dementia patients.

Fourth, to evaluate the construct validity of the K-POAKS, the Kaiser-Meyer-Olkin (KMO) test for sampling adequacy and Bartlett test were conducted and exploratory factor analysis was also performed. In addition, in the exploratory factor analysis, principal component analysis was conducted using the varimax rotation method in order to investigate the factor structure of the K-POAKS.

RESULTS

1. General Characteristics of Participants

The mean age of the participants was 41.6 years, and people aged 50 or over were 54 people (30.2%), accounting for the largest proportion. For gender, 169 people (94.4%) were females. For marital status, 121 people (67.6%) were married and 58 people (32.4%) were unmarried. Regarding educational level, the participants consisted of 96 junior college graduates (53.6%), 77 college graduates (43.0%), and 6 people with a master’s or higher degree (3.4%). As for position, 147 people (43.0%) were staff nurses and 32 people (17.9%) were charge nurses or in a higher position. The mean period of working in hospitals was 12.35 years, and 66 people (36.9%) worked as nurses for 10~19 years, 45 people (25.1%) for 4 years or less, 38 people (21.2%) for 20 years or more, and 30 people (16.8%) for 5~9 years. The period of working in long-term care hospitals was 3.21 years on average, 1~5 years for 117 people (65.4%), over 5 years for 36 people (20.1%), and less than one year for 26 people (14.5%) (Table 1).

2. Internal Consistency Reliability

The K-POAKS consists of a total of 24 items, and respondents are required to answer ‘Yes’, ‘No’, and ‘Do not know.’ The responses are scored by assigning 1 point for a

Table 1. General Characteristics of Nurses in Long Term Care Hospitals (N=179)

Variables	Categories	n (%) or M \pm SD
Gender	Women	169 (94.4)
	Men	10 (5.6)
Age (year)	20~29	30 (16.8)
	30~39	48 (26.7)
	40~49	47 (26.3)
	\geq 50	54 (30.2)
		41.62 \pm 2.32
Marital status	Single	58 (32.4)
	Married	121 (67.6)
Education	Diploma	96 (53.6)
	Bachelor	77 (43.0)
	Master	6 (3.4)
Job position	Staff nurse	147 (82.1)
	Chare nurse	32 (17.9)
Total clinical experience (year)	\leq 4	45 (25.1)
	5~9	30 (16.8)
	10~19	66 (36.9)
	\geq 20	38 (21.2)
		12.35 \pm 9.08
LTC experience (year)	<1	26 (14.5)
	1~5	117 (65.4)
	\geq 6	36 (20.1)
		3.21 \pm 3.12

LTC=Long term care

correct answer and 0 points for an incorrect answer or ‘Do not know’, and higher scores indicate higher levels of knowledge. The KR-20 coefficient, a measure of internal consistency reliability, was .84 for the original tool. In this study, the KR-20 for all items was .75 (Table 2). Regarding the KR-20 for each factor, the KR 20 was .69 for factor 1, .77 for factor 2, .68 for factor 3, and .68 for factor 4.

3. Content Validity

In the evaluation of content validity by experts, the CVI of each of the items of the K-POAKS was 0.84 or higher, indicating that the K-POAKS has an appropriate level of content validity as a tool to assess nurses’ knowledge of pain in older adults including dementia patients (Table 2).

4. Item Analysis

In this study, the item-to-total correlation (ICT) was used to determine the correlation between each item and total items. Item 4 ($r=.01$, $p=.847$) and item 21 ($r=-.09$, $p=.226$) were found to have no significant correlation, but the

Table 2. Content Validity Index, Internal Reliability, Item-total Correlation and Level of Korean Version of The Pain in Older Adults Knowledge Survey (K-POAKS) (N=179)

No	Contents	CVI	Alpha if item dropped	Item-total correlation	M±SD
1	Exercise, such as strengthening activities, may decrease the intensity of pain for some conditions in older people.	.84	.76	.15 (.041)	0.72±0.44
2	Older people should not be given strong drugs such as morphine.	.90	.74	.45 (<.001)	0.63±0.48
3	Cultural background has no influence on how people express their pain.	.84	.73	.48 (<.001)	0.91±0.28
4	Blood pressure, heart rate and respiration are not always reliable physiological indicators of pain intensity in older people.	.87	.77	.01 (.847)	0.26±0.44
5	If an older person can be distracted from their pain you can assume that their pain is not severe.	.84	.75	.32 (<.001)	0.51±0.50
6	Research has shown that the majority of people with dementia are not likely to have pain.	.87	.73	.50 (<.001)	0.81±0.39
7	A combined treatment plan using pain medication and other therapies is more likely to relieve pain than a single treatment option.	.93	.74	.33 (<.001)	0.81±0.38
8	People with dementia are not able to let you know that they have pain.	.87	.73	.50 (<.001)	0.83±0.37
9	Short acting pain medication given before an activity (such as a wound dressing or a transfer from bed to chair) is not effective in reducing predictable pain in older people.	.87	.73	.49 (<.001)	0.81±0.38
10	Behaviors described as aggression, restlessness or resistiveness to care can be symptoms of pain in older people with dementia.	.90	.73	.44 (<.001)	0.83±0.37
11	Assessment of pain in older people should also include assessing how pain impacts on their activities.	.90	.73	.60 (<.001)	0.91±0.28
12	Pain is less common in older people than younger people.	.93	.74	.42 (<.001)	0.68±0.46
13	The use of a pain assessment tool is recommended for thorough assessment of pain in older people.	.87	.73	.48 (<.001)	0.87±0.33
14	If an older person reports pain, then they should be believed.	.90	.74	.37 (<.001)	0.73±0.44
15	Pain in people who have dementia is commonly over treated.	.84	.74	.38 (<.001)	0.55±0.49
16	It is essential that response to treatment for pain is recorded and communicated.	1.0	.73	.51 (<.001)	0.89±0.30
17	Changes in appetite or sleep patterns can mean that the older person has pain.	.96	.73	.55 (<.001)	0.89±0.30
18	Grimacing and frowning can be signs of pain in older people.	.93	.73	.65 (<.001)	0.95±0.20
19	Observation of behavioural changes is the best way to assess pain in older people with dementia who cannot self-report.	.87	.74	.39 (<.001)	0.89±0.30
20	Vocalizations such as sighing, whimpering or groaning are common signs of pain in older people with communication difficulties.	.93	.73	.49 (<.001)	0.92±0.26
21	Assessment of pain in older people when they are at rest indicates whether pain is present at other times.	.87	.76	-.09 (.226)	0.08±0.27
22	Vocalizing and guarding may be indicative of pain.	.96	.74	.37 (<.001)	0.95±0.21
23	Pain assessments with older people should also include assessment of pain when moving.	.90	.73	.56 (<.001)	0.92±0.26
24	Older people may use words other than "pain" to describe what they are feeling	.93	.74	.45 (<.001)	0.96±0.19
Total			.75		

CVI=Content validity index.

ICTs of the remaining 22 items ranged from .15 to .65, showing that each of the items has a significant correlation. There were no items with an excessively high contribution rate of .80 or higher.

The mean knowledge score of 22 items, except items 4 and 21, ranged from 0.51 to 0.96. If the mean knowledge score is around 0.5, it indicates that approximately 50% of the respondents answered the item correctly. The mean knowledge score was about 0.5 in 2 items, about 0.6 in 2 items, about 0.7 in 2 items, about 0.8 in 9 items, and about 0.9 in 7 items, indicating the items were slightly easy in terms of the difficulty level. However, for items 4 and 21, which were shown to have a low ICT, the mean knowledge scores were 0.26 and 0.08, respectively, showing that they were very difficult questions (Table 2).

5. Criterion Validity (Concurrent Validity)

The analysis of the relationship between the K-POAKS and the tool to measure nurses' attitudes towards pain management in dementia patients and between the K-POAKS and the tool to measure performance of pain management in dementia patients revealed that the K-POAKS has a significant positive correlation with both the attitude measurement tool ($r=.28, p<.001$) and the performance measurement tool ($r=.21, p=.004$) (Table 3).

Table 3. Pearson Correlation Coefficient between Attitude, Performance scale and Korean Version of The Pain in Older Adults Knowledge Survey (K-POAKS) Scale (N=179)

Variables	Attitude	Performance
	r (p)	r (p)
Knowledge	.28 (<.001)	.21 (.004)

6. Construct Validity

The univariate analysis for each item was performed to investigate if each item meets the assumptions or criteria for factor analysis. The results showed that there were no items that did not have a normal distribution. In addition, the ranges of the skewness and kurtosis of each item did not exceed ± 2 , indicating that the assumption of normality was satisfied. To confirm whether the items were appropriate for factor analysis, the Kaiser-Meyer-Olkin (KMO) test for each of the 24 items was performed, and the KMO value was .77. In addition, in the Bartlett test, the correlation matrix for the 24 items was $\chi^2=1,120.35 (p<.001)$, showing statistically significant differences, so the items

were shown to be suitable for factor analysis (Table 4). The communality indicates the percentage of variance explained by the extracted factors. If the communality value of an item is below 0.4, it is considered desirable to exclude the item from factor analysis [20]. In the present study, since there were no items with a communality value of less than 0.4, all the items were included in the factor analysis. In the exploratory factor analysis, principal component analysis was conducted using the varimax rotation method in order to assess construct validity, and as a result, seven factors with eigenvalues of 1.0 or higher were extracted. Among the seven extracted factors, except for factors 5, 6, and 7, each of which consists of one item, the other factors were named as follows: factor 1 was named pain assessment and treatment, factor 2 methods of pain expression in older adults, factor 3 pharmacological pain therapy and misconceptions about pain in older adults, factor 4 objective pain assessment in older adults. Regarding the factor loading, which indicates the degree of correlation between each variable and the factor, except for three items of items 1, 4, and 21, factor loadings for the 21 items were all significant levels of .40 or higher. A total of 7 factors were found to account for 58.5% of nurses' knowledge of pain in dementia patients (Table 4).

DISCUSSION

This study aimed to develop a Korean-translated version of the POAKS created by Fetherstonhaugh et al. [7] in order to assess knowledge regarding pain in older adults among long-term care hospital nurses and nurses specializing in the nursing care of older adults and also attempted to evaluate the reliability and validity of the newly developed tool, the K-POAKS. The POAKS was developed to measure nurses' knowledge about the experience, assessment and management of pain in older adults. This study was conducted on the notion that the POAKS can also be used to evaluate the effectiveness of evidence-based educational interventions to improve nurses' knowledge about pain in older adults, including dementia patients.

In conducting scientific research, it is important to use instruments that have been proven to have good reliability and validity [22]. Reliability is the consistency of measurements when the same test is repeatedly performed on the subjects [23]. This refers to the consistency of an instrument regarding how accurately the construct the instrument is intended to measure is measured without errors. In this study, internal consistency reliability was measured to evaluate reliability. The KR-20 test was conducted to assess the internal consistency of the K-POAKS, and the

Table 4. Korean Version of The Pain in Older Adults Knowledge Survey (K-POAKS) Factor Loadings, Eigenvalue and Explained of Variance (N=179)

Variables or item	Factor						
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Factor 7
13	.69						
10	.68						
11	.58						
17	.57						
14	.50						
16	.46						
15	.43						
22		.79					
23		.75					
24		.59					
18		.58					
8			.73				
12			.71				
9			.63				
3			.51				
2			.42				
19				.71			
20				.70			
7					.75		
6						.57	
5							.53
Eigenvalue	2.82	2.61	2.37	2.12	1.41	1.39	1.30
Proportion (% of variance)	11.77	10.88	9.87	8.85	5.88	5.81	5.44
Cumulative (%)	11.77	22.66	32.53	41.38	47.26	53.08	58.52
Reliability	.69	.77	.68	.68			
KMO=.77, Bartlett's $\chi^2=1,120.35$ ($p < .001$)							

KMO=Kaiser-Meyer-Olkin.

KR-20 of the K-POAKS was estimated to be .75, which is lower than the KR-20 value of .84 obtained in a previous study [7]. Since it is generally considered that the KR-20 of .70 or above indicates an acceptable level of internal consistency reliability and the KR-20 of .80 or above indicates a high level of internal consistency reliability [24], it can be said that the internal consistency of this tool was verified. However, the internal consistency of each factor ranged from .68 to .77, showing the necessity for further research to improve consistency between items within a factor.

The item-total correlation (ITC) is used as another approach to verification of internal consistency, and the ICT for each item was calculated. As a result, except for items 4 and 21, all the items were found to have a significant correlation, demonstrating that the K-POAKS has an adequate level of internal consistency reliability as an assessment tool for long-term care hospital nurses. Item 4 was 'Blood pressure, heart rate, and respiratory rate are not always reliable physiological indicators in assessing pain intensity in older adults.' The ICT of this item was a very low value

of .01, and the mean knowledge score was 0.26 points out of 1, indicating that it is a question with a high level of difficulty. The correct answer of this question is 'Yes', and it expresses the fact that many older adults suffer from chronic pain and chronic pain does not always accompany changes in physiological indicators such as blood pressure, heart rate, and respiratory rate [4]. Based on the re-discussion with experts, this knowledge was considered essential for nurses working in long-term care hospitals, so it was determined to use item 4 after revising it into a clearer statement 'Blood pressure, heart rate, and respiratory rate are not always reliable physiological indicators in assessing pain intensity in older people.' Item 21 was 'Assessment of pain at rest in older adults indicates whether they usually experience pain in daily life.' The ICT of the item was -.09, showing a negative correlation, and the mean knowledge score was also 0.08 points out of 1, indicating that almost no nurses chose the correct answer. This item means that if assessment of pain in older adults during rest shows absence of pain, it indicates that pain is also absent at other times. In fact, even though older adults do not complain of pain during rest, they sometimes report that they feel pain during some activities. In assessing pain intensity, it is desirable to measure pain not only during rest but also during a movement or activity [4], so the correct answer to the question is 'No.' Based on experts' opinion that it is difficult to clearly convey the meaning of item 21 in Korean and it is not an essential item, it is considered necessary to discard this item and conduct reevaluation of internal consistency in the future.

Except for items 4 and 21, the mean knowledge score of the total 22 items about knowledge about pain in older adults was 0.74 points out of 1, which can be regarded as an appropriate level. Among the 22 items, there were 14 items with the correct answer of 'Yes' and the mean knowledge score of the items was 0.87 points. For 8 items with the correct answer of 'No', the mean knowledge score was 0.62 points, showing that the correct answer rate of the items with the correct answer of 'No' was lower. When developing a knowledge assessment tool, the difficulty of the items should be adjusted appropriately, and especially when creating questions that require selecting 'No' as the answer, they need to be phrased clearly to ensure that participants will not select an incorrect answer due to the lack of clarity of the question rather than a lack of related knowledge.

In general, in addition to internal consistency, test-retest reliability is also used as a method to verify the reliability of instruments. Test-retest reliability is assessed to examine the degree to which the same results can be obtained

when a tool is repeatedly used in order to confirm the stability of the tool. Since only internal consistency was verified in this study, it is considered that further studies are needed to establish the reliability of this tool by assessing test-retest reliability.

Validity indicates the appropriateness of interpretations of the results obtained by a measurement tool or test used in a group of subjects [25], and is the extent to which evidence or a theory supports the analysis obtained by using a tool [23]. It is assessed to examine how well a tool represents the construct that the tool is designed to measure. In this study, factor analysis was used to evaluate content validity, criterion-related validity, and construct validity. Content validity should be evaluated to investigate whether the tool covers all domains of the construct that it is intended to measure. If the standardization of a translated instrument is the goal, content validity may not be presented. However, under the assumption that validity represents the appropriateness of the interpretations of measurement results, if a tool involves aspects to take into consideration regarding the use of the tool due to cultural differences between the target populations, it is considered desirable to provide evidence of content validity even when translated versions of tools are used. 12 experts participated in the evaluation procedure of content validity by rating each item on a 4-point scale, and the CVIs of all 24 items were found to be 0.84 or higher. A CVI of 0.5 or less is considered to indicate the lack of content validity, and a CVI of 0.8 or more is considered to indicate a high level of content validity [15]. Therefore, it can be said that this tool contains items relevant to the construct to assess nurses' knowledge of pain in dementia patients.

Criterion validity is measured to determine whether there is a high correlation between a newly developed tool and an external criterion, and empirical evidence should be provided to determine whether a newly developed tool measures what it is intended to measure. The traditional method of measuring criterion validity is to select a standardized tool widely used and recognized in the field and measure the degree of correlation between a standardized and a newly developed tool [15]. However, it was difficult to find a standardized tool for measuring knowledge about pain in patients with dementia. Concurrent validity and predictive validity can be used as the criteria for evaluation of criterion-related validity. In this study, based on the findings of previous studies that as the level of knowledge about pain in dementia patients increased, the levels of attitudes and performance were increased [9,19], the measurements of the K-POAKS, a tool to measure attitudes towards pain management in dementia patients [19], and a

tool to measure performance of pain management in dementia patients [20] were conducted simultaneously, and concurrent validity was estimated by correlation analysis. Analysis results showed that the K-POAKS has a significant correlation of an intermediate level with the assessment tools to measure attitudes towards pain management in dementia patients and performance of pain management in dementia patients. These findings indicate that as the level of knowledge about pain in dementia patients increases, the level of attitudes towards pain management and the level of performance of pain management are increased, demonstrating the criterion validity of the K-POAKS. However, since the tools used to measure criterion validity were not gold standards, further research is required to evaluate the criterion-related validity of the K-POAKS using a standardized tool.

With respect to the evaluation of construct validity, although the authors of the POAKS assessed the discriminant validity of the original version, in the present study, factor extraction was performed using principal component analysis when conducting exploratory factor analysis in order to examine construct validity. Also, to examine the correlations between the variables used to measure the construct, we used the varimax rotation method to simplify the factor structure. Factor analysis is a statistical process in which a small number of general latent variables are found or created from many observable characteristics (measured variables), and latent variables are theoretical, unobservable underlying factors which generate correlations between the measured variables [26]. The Kaiser criterion is generally used to estimate the eigenvalue, which is the sum of squared factor loadings across all items for each factor, and the larger the eigenvalue, the higher the likelihood that there is a latent factor underlying measured variables [21]. The Kaiser rule is that we should retain only factors for which the eigenvalue of the sample correlation matrix is greater than 1.0 [21,27,28]. In this study, the KMO value for sampling adequacy was 0.77, which is classified as an intermediate level, so it was shown that the selection of variables for factor analysis was adequate.

In this study, the communalities of all 24 items were 0.4 or higher, so factor analysis was conducted for all the items. As a result, 7 factors with eigenvalues of 1.0 or higher were extracted. If the factor loading is 0.4 or higher, the item can be classified as an item of the relevant factor. Items with a factor loading of 0.4 or higher were assigned to 7 factors. The cumulative explained variance was 58.5%, which indicates that the identified factors explain 58.5% of nurses' knowledge about pain in dementia patients. In the

original instrument developed by Fetherstonhaugh et al. [7], the eigenvalue was presented as 5.3 for the first factor and the explained variance ratio was reported to be 22.2%, but the cumulative explained variance ratio was not presented. According to Hair et al. [29], in general, when the cumulative explained variance ratio is approximately 50~60%, the factors are considered to have explanatory power. In this respect, the cumulative explained variance of 58.5% indicates that the K-POAKS is a tool which can be used to measure nurses' knowledge about pain in dementia patients. However, in the evaluation of validity through factor analysis, the factor structure may vary depending on the sample or the sample size of the survey. Therefore, it is required to conduct repeated studies to evaluate validity by adjusting the composition or items of the questionnaire and to examine the effectiveness of the K-POAKS among long-term care hospital nurses after implementing training in pain management of dementia patients including older adults in order to improve the explanatory power of the K-POAKS through revision and supplementation.

Items 1, 4 and 21 were found to have a factor loading of less than 0.3, but all the remaining 21 items were found to be significant with a factor loading of 0.3 or higher. Items 4 and 21, which have a factor loading of 0.3 or less, were already shown to have a low item-total correlation by factor analysis, so it is considered desirable to modify or delete them when using this tool in the future. Item 1, with a factor loading of 0.3 or less, was 'Exercises such as physical activity strengthening can reduce pain intensity in older adults.' The correct answer to the question was 'Yes', and the mean knowledge score was 0.72 points. As a result of rediscussion with experts, it was decided to use it by revising it into 'Muscle strengthening exercise can relieve specific kinds of pain in older adults.'

The study results described above indicate that the K-POAKS, which is a Korean-translated version of the POAKS created by Fetherstonhaugh et al. [7], has adequate levels of reliability and validity. The K-POAKS consists of a total of 24 items and 7 sub-factors, and it is a valid assessment tool which can be used to measure nurses' knowledge about pain experience of older adults and assessment and management of pain in older adults. The active utilization of the K-POAKS is expected to contribute to the improvement of long-term care hospital nurses' knowledge of pain in older adults including dementia patients and the accurate measurement of the effects of related education. However, further research is needed for the two items with a low factor loading and a low item-total correlation.

CONCLUSION

In this study, we developed the K-POAKS, a Korean version of the Pain in Older Adults Knowledge Survey (POAKS), in order to assess knowledge about pain in older adults, including dementia patients, and we attempted to evaluate the reliability and validity of the K-POAKS. The K-POAKS consists of 24 questions and 7 factors to examine the pain experience in older adults and nurses' knowledge about pain assessment and management, and the reliability and validity of this tool were verified through testing and assessment procedures. However, it was found that further research is required to clarify the meanings of two items. The K-POAKS is expected to help healthcare workers taking care of older adults with chronic illnesses, including dementia patients, to assess and manage pain in older adults. This study has limitations in generalizing the study findings, because data was collected among nurses working in some long-term care hospitals who were selected as participants by convenience sampling. Therefore, in future studies, there is a need to expand the participants to include nurses working in acute care hospitals as well as those working in long-term care hospitals to verify the reliability and validity of this tool.

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Appendix. Korean Version of the Pain in Older Adults Knowledge Survey (K-POAKS)

번호	문항	예	아니오	모름
1	근력강화 운동은 노인의 특정 통증을 완화시킬 수 있다.	○		
2	노인에게 모르핀과 같은 강력한 약물을 투여해서는 안된다.		○	
3	문화적 배경은 사람들이 통증을 표현하는 방법에 아무런 영향을 미치지 않는다.		○	
4	노인들의 통증강도를 확인하는데 있어서 혈압, 심방동수, 호흡이 항상 신뢰할 만한 생리적 지표는 아니다.	○		
5	만약 노인이 아픈 것에 집중하지 않고 주의를 돌릴 수 있으면 통증이 심하지 않은 것으로 짐작 할 수 있다.		○	
6	연구에 의하면 대다수의 치매 환자는 통증을 느끼지 않을 것으로 나타났다.		○	
7	진통제와 다른 요법을 병용한 치료 계획은 단일 치료법보다 통증 완화에 더 효과적이다.	○		
8	치매 환자는 통증이 있음을 알릴 수 없다		○	
9	노인들에게 상처드레싱이나 침대에서 의자로 이동하기 전에 속효성 진통제를 투약하는 것은 예측되는 통증을 감소시키는데 효과적이지 않다.		○	
10	공격, 불안, 돌봄에 대한 저항 등의 행동은 치매노인의 통증 증상일 수 있다.	○		
11	노인의 통증 사정 시 통증이 노인의 활동에 미치는 영향정도를 포함해야 한다.	○		
12	노인들은 젊은 사람들에 비해 통증을 덜 느낀다.		○	
13	정확한 노인통증사정을 위해 통증 사정도구의 사용이 권장된다.	○		
14	노인이 통증을 호소한다면 믿어야 한다.	○		
15	치매를 가진 사람들의 통증은 대개 과잉 치료된다.		○	
16	통증치료에 대한 반응을 기록하고 전달하는 것은 필수적이다.	○		
17	식욕이나 수면 양상의 변화는 노인에게 통증이 있음을 의미할 수 있다.	○		
18	찌그러진 얼굴과 찌푸린 표정은 노인 통증의 징후가 될 수 있다.	○		
19	행동변화 관찰은 통증을 자가보고 할 수 없는 치매노인의 통증을 사정하는 가장 좋은 방법이다.	○		
20	한숨, 끄끙거림, 신음 등은 의사소통이 어려운 노인들의 흔한 통증 징후이다.	○		
21	노인의 휴식 시 통증사정은 평소에도 통증이 있는지 여부를 나타낸다.		○	
22	소리를 내고 신체일부를 방어하는 것은 통증의 지표가 될 수 있다.	○		
23	노인 통증사정에는 움직임 때의 통증사정도 포함되어야 한다.	○		
24	노인들은 “통증” 이외의 단어를 사용하여 자신이 느끼는 것을 묘사할 수도 있다.	○		

*문항 4, 21은 삭제하고 사용할 것을 권유함.