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ORIGINAL ARTICLE

Cross-cultural Adaptation of the Knowledge and Attitude of Pain into Japanese and Test–retest Reliability in Undergraduate Students

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Objectives: Pain neuroscience education (PNE) has been shown to be effective in reducing pain in people with chronic musculoskeletal pain. Knowledge of pain physiology is necessary to undertake PNE, and a measure for such knowledge is necessary. The Knowledge and Attitudes of Pain (KNAP), a comprehensive assessment of knowledge, attitudes, and beliefs regarding pain for healthcare practitioners, was developed in 2020 through the assessment of construct validity, reliability, and responsiveness in Dutch and English. This study aimed to conduct cross-cultural adaptation of the KNAP into Japanese and to verify test–retest reliability among Japanese undergraduate physical therapy and occupational therapy students. **Methods:** Cross-cultural adaptation was performed using Beaton's five-step process. Subsequently, the KNAP was completed by participants with a 2-week interval. The study included second-, third-, and fourth-year undergraduate physical therapy and occupational therapy students. **Results:** A total of 50 students participated in the pilot test and a Japanese version of KNAP was created. Thirty-nine students completed the Japanese version of KNAP twice. Of the 30 items on the KNAP, the quadratic weighted kappa value was less than 0.4 for only one item (item 15), but reliability was interpreted as sufficient for the overall score, with an intraclass correlation coefficient (95% confidence interval) for the total score of 0.89 (0.80–0.94). **Conclusions:** This study has developed the Japanese KNAP, which has shown preliminary evidence of adequate test–retest reliability in Japanese undergraduate physical therapy and occupational therapy students.

Key Words: musculoskeletal pain; Pain neuroscience education; pain physiology; questionnaire

INTRODUCTION

Recently, pain neuroscience education (PNE) has been shown to be effective in reducing pain in people with chronic musculoskeletal pain[1,2] and may be particularly beneficial for patients with certain conditions.[3,4] PNE is an educational method among therapeutic approaches used by physical therapists or occupational therapists to transfer physiological knowledge about pain to patients and to change the concept of pain from a biomedical to a biopsychosocial phenomenon.[5]

Questionnaires that assess knowledge, attitudes, and beliefs regarding pain are considered a possible way to assess whether a therapist is ready to perform PNE. Typical examples of assessment include the Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT),[6] the Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS),[7] and the Neurophysiology of Pain Questionnaire (NPQ).[8,9] The PABS-PT assesses the extent to which a physical therapist's attitudes and beliefs about low-back pain are based on biomedical and biopsychosocial perspectives. However, the PABS-PT does not fully reflect recent findings in pain neuroscience and is inappropriate for testing knowledge about pain, which is important for evaluating PNE. The HC-PAIRS assesses only the extent to which

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healthcare professionals' attitudes and beliefs regarding chronic low-back pain are considered from a biomedical perspective. Furthermore, the NPQ asks for correct and incorrect answers regarding pain knowledge and may contain unnecessary questions,[9,10] which raises questions regarding content validity. Therefore, the Knowledge and Attitudes of Pain (KNAP) questionnaire, a comprehensive assessment of knowledge, attitudes, and beliefs about pain, was developed in 2020 through the assessment of construct validity, reliability, and responsiveness for undergraduate students.[11] The KNAP has a two-factor structure (domain 1 with 21 items: pain physiology and influencing factors; domain 2 with nine items: treatment of pain) with a six-point Likert scale (completely disagree, to a large extent disagree, somewhat disagree, somewhat agree, to a large extent agree, and completely agree).

The Japanese version of the KNAP has not yet been created. Therefore, this study aimed to undertake cross-cultural adaptation of the KNAP into Japanese and to verify test–retest reliability in undergraduate physical and occupational therapy students.

MATERIALS AND METHODS

Design

First, permission for cross-cultural adaptation was obtained from Anneke J. Beetsma, the developer of KNAP. Then, adaptation was undertaken through five steps: (1) forward translation, (2) creation of an integrated version of the forward translation, (3) backward translation, (4) creation of a provisional Japanese version, and (5) a pilot test that followed the international guidelines for cross-cultural adaptation of patient-reported outcome measures (PROMs).[12] Participants in the pilot test were invited for a test–retest reliability examination. All participants provided written consent before data collection. This study was conducted with permission from the Institutional Research Ethics Committee of the Saitama Prefectural University (No. 21011).

Forward and Backward Translations

For step 1, two translators, native Japanese speakers, independently translated the text from English to Japanese. Of the two translators, one was the author, a physical therapist who understood the KNAP, and the other was an English scholar who was unaware of the KNAP. For step 2, the two translators and another author discussed and created the integrated version from the two forward translations. For step 3, two nonmedical bilingual translators (respective first and second languages being English and Japanese) independently translated the Japanese integrated version into English. At that time, the concept of KNAP and the process of its creation were blinded. For step 4, the cross-cultural adaptation development team (two forward translators, two back translators, and the author) discussed the consistency of the two backward translations with the original translation, and a provisional Japanese version of KNAP was produced.

Pilot Test

Participants were recruited via email from the Saitama Prefectural University (Saitama Japan) in August 2021. Those who were second-, third-, or fourth-year physical therapy or occupational therapy students whose first language was Japanese were eligible for participation. Data were collected through a name-based online survey (SurveyMonkey). In accordance with the previous study,[13] the participants rated each question, including the explanatory text, on a five-point numerical rating scale (1: the meaning is not understood at all as Japanese; 5: the meaning is fully understood as Japanese). The participants were asked to comment freely on what part of the expression was unclear or how it should be corrected when they chose ratings 1–3. On the basis of the comments obtained, the cross-cultural adaptation development team discussed and prepared the final Japanese version of the KNAP. It was decided that data should be collected from 50 participants at the pilot test stage. This cohort size was based on the expectation that a minimum of 30 data samples were to be taken in the subsequent test–retest reliability from a 60% participation rate at the end of the study.

Reliability

Those who participated in the pilot test were approached via email in September 2021. The participants were asked to respond to the provisional Japanese version of the KNAP on SurveyMonkey. Two weeks later, the participants who had responded previously were again asked to respond to the provisional Japanese version of KNAP on SurveyMonkey. Reminders to complete the KNAP were sent to participants 5 days after the first and second recruitment rounds. The KNAP scores were calculated based on the original score calculation methods,[11] and the overall score was calculated using the Rasch score (0–150). Internal consistency was calculated using Cronbach's alpha in each domain and in total using the KNAP scores of the first survey participants. The minimum acceptable value of Cronbach's alpha was 0.7.[14] For test–retest reliability, quadratic weighted kappa was obtained for each item, and intraclass correlation coefficient

Table 1. Characteristics of the study participants

	Pilot test (n = 50)	Test–retest reliability	
		First survey (n = 44)	Second survey (n = 39)
Age (years, mean ± SD)	20.4 (0.7)	20.3 (0.7)	20.3 (0.7)
Gender (men: women)	23 (46.0): 27 (54.0)	18 (40.9): 26 (59.1)	15 (38.5) : 24 (61.5)
Year (2nd: 3rd: 4th)	6 (12.0) : 35 (70.0) :9 (18.0)	5 (11.3) : 32 (72.7) : 7 (15.9)	5 (12.8) : 28 (71.8) : 6 (15.4)
Study subject (PT: OT)	40 (80.0) : 10 (20.0)	35 (79.5) : 9 (20.5)	33 (84.6) : 6 (15.4)

Unless otherwise noted, values are for the number of subjects and as a percentage of the total: n (%).
PT, physical therapy; OT, occupational therapy.

(ICC) was obtained for the total score. Furthermore, the minimum detectable change (MDC) was calculated for the sum scores using the following formulas:

$$SEm = SD\sqrt{1 - ICC} \quad (1)$$

$$MDC = SEm \times 1.96 \times \sqrt{2} \quad (2)$$

where SD is the standard deviation of the data samples in the initial survey.

Iterative outlier removal with two iterations was performed when the difference was greater than 3 × SD (99%)[15] because the MDC is sensitive to outliers. Spearman's rho was used to calculate interdomain correlation. The interpretation of the ICC, kappa, and rho values was as follows: ≤0.40, weak; 0.41–0.74, moderate; ≥0.75, strong.[16] Statistical analysis was performed using IBM SPSS Statistics for Windows, version 21 (IBM, Armonk, NY, USA).

RESULTS

Creation of Provisional Japanese Version

The provisional Japanese version was developed through step 2 (https://doi.org/10.6084/m9.figshare.18356627) and step 4 (https://doi.org/10.6084/m9.figshare.18357860), where only items that required discussion are listed.

Pilot Test

Table 1 shows the characteristics of the participants in the pilot test. **Table 2** shows the mean and standard deviation of the five-point numerical rating scale and the percentage of those who scored 4 or higher. The provisional Japanese version and the process modifications were summarized (https://doi.org/10.6084/m9.figshare.18358475). Consequently, the final Japanese version of the KNAP questionnaire (https://doi.org/10.6084/m9.figshare.18359102) was developed.

Reliability Assessments

A total of 44 respondents participated in the first survey after the pilot test, and 39 participated in the second survey (**Table 1**). In the first survey, the mean score (standard deviation) of the KNAP was 84.23 (8.98) points. The alpha value was 0.87 for the first factor, 0.84 for the second factor, and 0.92 for all items, all indicating adequate internal consistency. **Table 3** shows the reliability assessment results for each item. The kappa values of all items were larger than 0.4 except for item 15 (0.35), and reliability was interpreted as sufficient for the overall score with an ICC value (95% confidence interval) for the total score of 0.89 (0.80–0.94). No outliers were excluded in the calculation of the MDC, and the MDC was 8.3 points. The correlation between the first and second factors was $\rho = 0.74$ ($P<0.001$).

DISCUSSION

This study conducted a cross-cultural Japanese adaptation of the KNAP questionnaire, which is a promising measure of the contemporary understanding of knowledge, attitudes, and beliefs about pain. Adequate knowledge in this area is considered necessary for therapists to perform PNE. Our intention was to make the KNAP applicable to a wide range of individuals, from undergraduate physical therapy and occupational therapy students to clinical therapists. Extensive technical terminology was avoided to allow undergraduate students to understand the process. The KNAP is the only PROM among other similar measures that can be used with undergraduate students and is not disease specific. Publication of the Japanese version of the KNAP in an open access journal allows a wide range of future use of the KNAP to examine its effectiveness for pain education in Japan.

In the pilot test, the overall mean score was 4.0 or higher except for item 2 (3.64). For all items except item 2, more than 70% of the respondents scored 4 or higher on a five-

Table 2. Results of the pilot test using the provisional Japanese version

Item no.	Five-point numerical scale for degree of understanding [a]	
	Mean (SD)	Proportion of participants scoring 4 or higher (%)
1	4.70 (0.67)	92
2	3.64 (1.23)	66
3	4.16 (0.95)	74
4	4.00 (0.94)	76
5	4.92 (0.34)	98
6	4.56 (0.78)	90
7	4.80 (0.57)	90
8	4.40 (0.80)	86
9	4.76 (0.55)	98
10	4.80 (0.63)	96
11	4.06 (1.07)	72
12	4.72 (0.49)	98
13	4.80 (0.40)	100
14	4.72 (0.49)	100
15	4.54 (0.81)	84
16	4.74 (0.66)	96
17	4.78 (0.46)	98
18	4.60 (0.77)	90
19	4.94 (0.24)	100
20	4.84 (0.42)	98
21	4.62 (0.77)	90
22	4.68 (0.65)	94
23	4.68 (0.65)	94
24	4.78 (0.54)	94
25	4.96 (0.20)	100
26	4.94 (0.24)	100
27	4.80 (0.53)	94
28	4.92 (0.34)	98
29	4.44 (1.04)	98
30	4.48 (1.02)	86

Descriptions in the provisional Japanese version are presented at https://doi.org/10.6084/m9.figshare.18359102.

[a] Rating scale: 1, the meaning is not understood at all as Japanese; 5, the meaning is fully understood as Japanese.

Table 3. Results of test–retest reliability

Item no.	Kappa with quadratic weighting	95% Confidence interval	
		Lower limit	Upper limit
1	0.78	0.54	0.98
2	0.51	0.2	0.81
3	0.67	0.33	1
4	0.45	0.05	0.86
5	0.62	0.19	1
6	0.48	0.11	0.84
7	0.63	0.28	0.98
8	0.63	0.27	0.99
9	0.77	0.49	1
10	0.43	0.11	0.76
11	0.53	0.18	0.87
12	0.51	0.2	0.82
13	0.61	0.31	0.91
14	0.44	0.14	0.74
15	0.35	0.1	0.6
16	0.54	0.2	0.88
17	0.48	0.17	0.8
18	0.63	0.29	0.96
19	0.71	0.52	0.91
20	0.75	0.63	0.88
21	0.7	0.57	0.84
22	0.57	0.26	0.88
23	0.68	0.35	1
24	0.69	0.47	0.92
25	0.59	0.12	1
26	0.72	0.39	1
27	0.66	0.29	1
28	0.84	- [a]	- [a]
29	0.56	0.13	0.98
30	0.66	0.42	0.91

[a] Could not be calculated.

point scale of understanding (**Table 2**). These results indicate that there was no critical problem with the expressions in the provisional Japanese version and minor modifications were sufficient to make the expressions understandable to most of the participants. Overall, there were several comments; for example, some participants did not understand the expression "pain system." To make it easier to understand the mechanism, the phrase "information processing system until pain is perceived" was used. This situation may have been related to the lower comprehension score in item 2.

The kappa values for 29 of the 30 questions (other than item 15) were higher than 0.4 in undergraduate physical therapy and occupational therapy students, and the overall score was highly reliable with an ICC value of 0.88. A previous study[11] in the Netherlands included 156 undergraduate physical therapy students and examined 3-week test–retest reliability; similar results (alpha = 0.78 and 0.71, ICC = 0.80, and MDC

= 4.99) were obtained in terms of internal consistency and ICC values of the total score. However, in the current study, the MDC of 8.33 was larger than that (4.99) reported in the previous study.[11] Although the ICC value is higher than that of the previous study,[11] the larger MDC indicates that the standard deviation in the current study sample was larger, which may reflect the larger sample size in the previous study.[11]

In this study, the correlation coefficient ($\rho = 0.74$) between the first and second factors of KNAP indicated a moderate interdomain correlation. To our knowledge, this is the first study to evaluate the interdomain correlation that supports the internal consistency of KNAP as a whole.

The MDC depends on the standard deviation of the population and is therefore affected by the sample size. In this study, the MDC was 8.33 points. Given that the reliability results are similar to those of previous studies, it can be assumed that the MDC will decrease when repeated with a larger sample size. Therefore, caution should be taken when using the MDC of 8.33 in this study as a cutoff value for pre/post- and intergroup comparisons, which is a limitation of this study. Therefore, it will be necessary to calculate clinically important changes in large-cohort studies in the future. Another potential study limitation is the possibility of bias induced by convenience sampling. The distributions of the target population's year of study and disciplines in the pilot test were unbalanced, where occupational therapy students accounted for 15%–20% of the total. Furthermore, we purposely retained the term "physical therapist" or "physical therapy" to ensure the content validity of the original study.[11] However, it is questionable whether occupational therapy students correctly understand physical therapy (particularly for items 27–29) and physical therapists are not the only experts in the treatment of pain. In this study, we focused only on linguistic cross-cultural adaptation and did not conduct a thorough examination of comprehensibility and comprehensiveness with respect to content validity. We consider that an increase in sample size and a reduction of population bias would increase the robustness of our research methodology. However, we do not believe that these limitations significantly compromise the results of this study because of the study's concentration on linguistic cross-cultural adaptation and test–retest reliability.

CONCLUSION

This study developed the Japanese version of the KNAP questionnaire. The test–retest reliability of the KNAP total score among undergraduate physical therapy and occupational therapy students was found to be adequate.

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CONFLICTS OF INTEREST

The authors report no conflicts of interest.

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