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Original Article

Confirmatory factor analysis of the Japanese Health Locus of Control scales among people with musculoskeletal disorders

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Abstract. [Purpose] To determine whether the 25-item Japanese Health Locus of Control (25-JHLC) scale satisfies a 5-factor structure among Japanese with musculoskeletal disorders. [Participants and Methods] The primary inclusion criterion was people undergoing physical therapy for musculoskeletal disorders in two medical facilities. The 25-JHLC scale and demographic data were obtained by conducting an anonymous survey. Confirmatory factor analysis was used to analyze data from the 25-JHLC scale in 200 patients with musculoskeletal disorders. Fits for the 5-factor structure (1-internal; 2-family; 3-professional; 4-chance; and 5-supernatural) and the 2-factor structure (1-internal; and 2-external, including family, professional, chance, and supernatural) were studied. The goodness-of-fit criteria included chi-squared/degree of freedom, goodness-of-fit index, adjusted goodness-of-fit index, and root mean square error of approximation. [Results] The mean (standard deviation) age of the participants was 46.3 (18.3) years of age. The 2-factor structure satisfied no criteria; however, the 5-factor structure satisfied two criteria for acceptable fit (chi-squared/degree of freedom, and root mean square error of approximation). [Conclusion] This study found that the 5-factor structure of the 25-JHLC scale can be accepted to some extent among Japanese with musculoskeletal disorders without comorbidities.

Key words: Attitude, Behavior, Self-management

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INTRODUCTION

Musculoskeletal (MSK) disorders are the second leading factor responsible for increasing the years lived with a disability[1)]. These disorders have a substantial impact on the individual as well as the wider social economy[2, 3)], and this impact has been growing recently[1)]. Prevention is crucial to reduce the substantial burden to the patient caused by MSK disorders[4, 5)]. It is necessary to support behavioral changes through therapeutic education for people with maladaptive behaviors to encourage the prevention of MSK disorders.

Therapeutic education considering patients' preferences and health decisions[6)] can be evaluated by using a measure for the health locus of control[7)]. The health locus of control assesses whether an individual's health-related behaviors are enhanced by internal factors (the idea that I control my health) or external factors (the idea that my health is controlled by something other than me). The health locus of control influences the effectiveness of treatments in MSK disorders, such as anterior cruciate ligament injuries in athletes[8)] and low back pain in people undergoing vocational rehabilitation[9)].

For the assessment of health locus of control, the I-E scale with a 2-factor structure assessing whether the patient has internal or external locus of control, the Health Locus of Control scale has been proposed. In 1978, the Multidimensional Health Locus of Control Scale[10)] with a 3-factor structure (i.e., internal, powerful others, and chance) has been developed,

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and Horike undertook a cross-cultural adaptation of the Multidimensional Health Locus of Control Scale into the Japanese language in 1988[11]. The researcher further investigated construct validity and participants' comprehensibility through three experiments and found that the 3-factor structure was not appropriate for Japanese culture[11]. The researcher then developed a 25-item Japanese Health Locus of Control (25-JHLC) scale, which had a five-factor structure with five questions for each factor (i.e., internal, family, professional, chance, and supernatural) by conducting an exploratory factor analysis of 91 possible items on Japanese attitudes toward health and illness among 328 university students[12]. However, there has been no evaluation of the construct validity of the 25-JHLC scale among patients with MSK disorders. We hypothesized that the 25-JHLC scale would satisfy the 5-factor structure, not the 2-factor structure (i.e., internal or external locus of control) that was proposed in the I-E scale, among patients with MSK disorders. Therefore, this study aimed to investigate if the 25-JHLC scale satisfies the 5-factor structure among Japanese people with MSK disorders.

PARTICIPANTS AND METHODS

Convenience sampling was used from October to December 2021. Inclusion criteria for the participants were as follows: 1) persons undergoing physical therapy because of MSK disorders in Sapporo Maruyama Orthopedic Hospital (Hokkaido) or Minami-Shinjuku Orthopaedic Rehabilitation Clinic (Tokyo), 2) aged 18 and above, and 3) persons whose first language is Japanese. Individuals without comorbidities such as dementia or a sequelae diagnosis of respiratory or neurological diseases were not eligible. The study was approved by the institutional research ethics committee at Saitama Prefectural University (No. 21046). Since this was an anonymous survey, participation in the survey constituted consent to the study.

The primary outcome measure was the 25-JHLC scale, with five factors (i.e., internal, family, professional, chance, and supernatural). In the 25-JHLC scale, participants rate their agreement with each statement by using a 6-point Likert scale (0=completely disagree to 5=completely agree). In this study, the following instruction was added: "Please think of 'illness' and 'health' here as referring to the disorder for which you have received physical therapy".

The following patient demographic measures were further collected: 1) age and gender, 2) pain intensity as measured using the four-item Pain Intensity Measure (P4)[13], 3) the location of symptoms, and 4) the duration of symptoms from the last symptom-free month (i.e., one week or less, from eight days to three months, and more than three months). The P4 is a valid and reliable patient reported outcome measure (PROM) for subjective pain intensity that uses an 11-point numerical rating scale to indicate the average pain intensity over the previous two days in four categories: pain in the morning, pain in the afternoon, pain in the evening, and pain brought on by activity. The higher the total score of P4, the greater the perceived intensity of the pain (0–40).

Data were obtained by conducting an anonymous survey. Data from 200 participants were collected, which satisfies a very good sample size for confirmatory factor analysis in the consensus-based standards for selecting health measurement instruments (7 times the number of items and ≥100)[14].

In this study, we analyzed the 25-JHLC scale data by comparing goodness-of-fit criteria between a 5-factor structure (1, internal; 2, family; 3, professional; 4, chance; and 5, supernatural) and a 2-factor structure (1, internal; and 2, external including family, professional, chance, and supernatural). The criteria were as follows: chi-squared/degree of freedom <2 (good fit) and <3 (acceptable fit); goodness-of-fit index >0.95 (good fit) and >0.90 (acceptable fit); adjusted goodness-of-fit index >0.97 (good fit) and >0.95 (acceptable fit); root mean square error of approximation <0.05 (good fit) and <0.08 (acceptable fit)[15].

Data imputation was conducted using a median value when the missing value was <5% as per a previous study[16]. IBM® SPSS® Amos™ 20.0 (Armonk, NY, USA) was used for the analysis.

RESULTS

Table 1 summarizes the demographics of the 200 participants. Table 2 summarizes missing data of the 25-JHLC scale, which were <5%, and thus 200 data were used for analysis after data imputation.

Figure 1 shows the 5-factor and 2-factor structure models and Table 3 shows the goodness-of-fit criteria of each model. Only the 5-factor structure model satisfied two criteria of acceptable fit.

DISCUSSION

This is the first study to evaluate the construct validity of the 25-JHLC scale, which assesses the locus of control for health among Japanese patients with MSK disorders. This study revealed that the 5-factor structure of the 25-JHLC scale was confirmed to some extent among Japanese patients with MSK disorders, and that it was at least not a simple 2-factor structure. These results support the existence of multiple external factors that are unique to the Japanese. For example, Horike[11] noted that the Japanese were unique in that they consider it luck whether or not they follow an influential person, and that chance is not good or bad luck as westerners associate it with, but a negative factor that indicates resignation.

On the other hand, only two criteria for acceptable fit were met for the 5-factor structure. The possible reason for this result may be related to the inclusion criteria used in this study. This study recruited patients who were already undergoing physical therapy. Therefore, the participants may have received some education about the importance of self-care, and the

Table 1. Demographics of the participants

Variables	N=200
Age (years)	46.3 ± 18.3
Gender (n of males: n of females)*	74: 125
Duration of symptoms (n of those with 1 week or less: n of those with 8 days–3 months: n of those with more than 3 months)†	7: 43: 143
4-item pain intensity measure (0–40)‡	13.6 ± 7.9
Symptom locations (n [%])§	
Neck	49 [24.5]
Shoulder	46 [23.0]
Upper back	11 [5.5]
Lower back	103 [51.5]
Buttocks	7 [3.5]
Upper limb	30 [15.0]
Lower limb	80 [40.0]

Values are presented with mean ± standard deviation, unless specified.
*1 missing data.
†7 missing data.
‡3 missing data.
§1 missing data.

Table 2. Missing data of the 25-item Japanese Health Locus of Control

Domain	Item No. Item description	Number of missing data	Missing rate [%]
Internal	Item 1. Whether or not the disease gets better depends on my own efforts.	0	0
	Item 2. To stay healthy, I have to look out for myself.	0	0
	Item 3. I take care of my own health.	2	1
	Item 4. It's up to me to stay healthy.	0	0
	Item 5. Whether or not my illness will get better depends on my own attitude.	1	0.5
Family	Item 1. Whether the disease gets better or not depends on the warm support of those around me.	1	0.5
	Item 2. When I am sick, the compassion of my family and others will help me recover.	1	0.5
	Item 3. It is the compassion of family members that keeps me healthy.	2	1
	Item 4. Whether the disease gets better or not depends on the cooperation of the family.	5	2.5
	Item 5. Getting better depends on having someone to cheer me up.	0	0
Professional	Item 1. How long it takes for a disease to get better depends on the skill of the medical staff.	2	1
	Item 2. I can stay healthy thanks to the progress of medicine.	1	0.5
	Item 3. How long it takes for a disease to get better varies from one medical professional to another.	0	0
	Item 4. If I do get sick, I will be fine with the help of medical professionals.	1	0.5
	Item 5. How long it takes for a disease to get better is left to the judgment of medical professionals.	0	0
Chance	Item 1. I'm lucky enough to have good health.	1	0.5
	Item 2. How long it takes for the disease to get better depends on my luck.	1	0.5
	Item 3. Things that affect my health usually happen by accident.	0	0
	Item 4. Getting sick is a coincidence.	2	1
	Item 5. Whether the disease gets better or not depends on fate.	0	0
Supernatural	Item 1. To stay healthy, I should worship often and take good care of my ancestors.	1	0.5
	Item 2. If I make offerings to the gods and Buddha and ask them to keep me safe, they will protect me from illness.	1	0.5
	Item 3. The cause of my illness is due to ancestral causes and other factors.	2	1
	Item 4. It is thanks to Gods that I am able to stay healthy.	0	0
	Item 5. I am sick because the ghosts that are floating around in this world have come to depend on me.	0	0

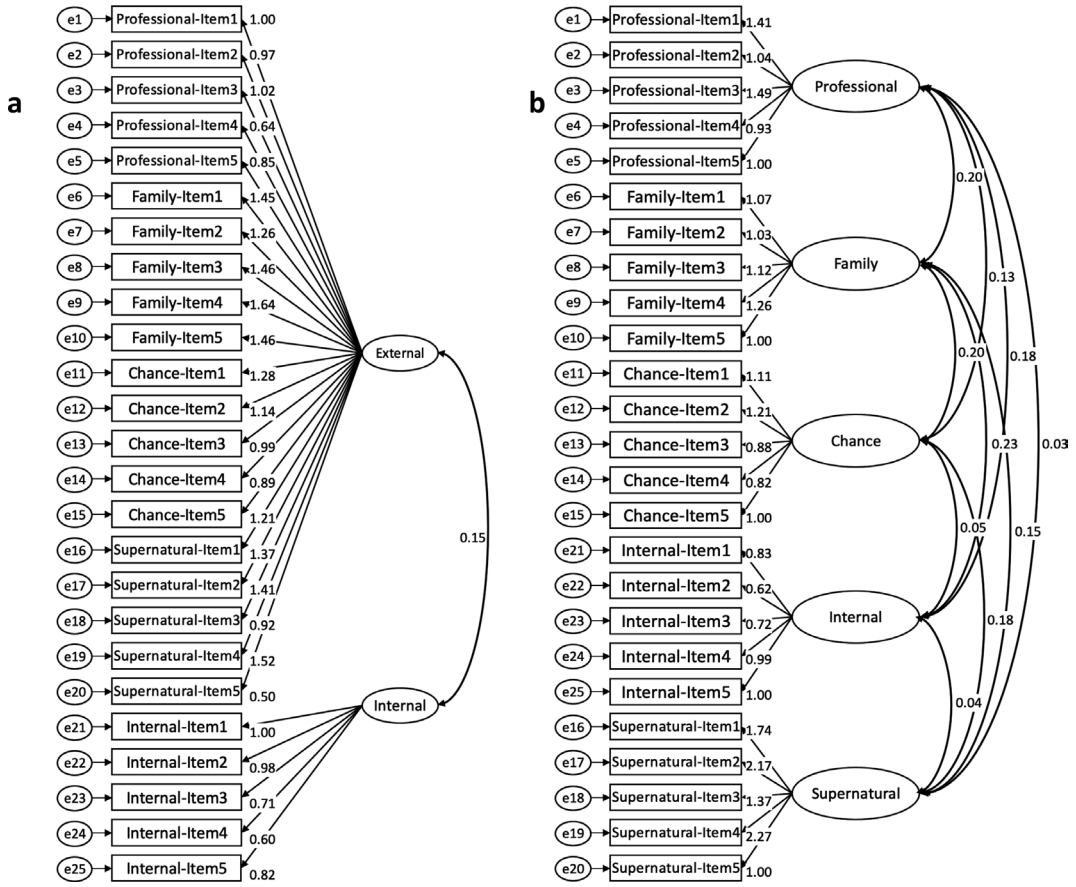

Fig. 1. 5-factor and 2-factor structure models.

Table 3. Goodness-of-fit results of each model

	2-factor structure model		5-factor structure model	
Chi-squared/ degree of freedom	4.150	Not fit	2.062	Acceptable fit
Goodness-of-fit index	0.623	Not fit	0.826	Not fit
Adjusted goodness-of-fit index	0.553	Not fit	0.787	Not fit
Root mean square error of approximation	0.126	Not fit	0.073	Acceptable fit

Chi-squared/degree of freedom <2 (good fit) and <3 (acceptable fit); Goodness-of-fit index >0.95 (good fit) and >0.90 (acceptable fit); Adjusted goodness-of-fit index >0.97 (good fit) and >0.95 (acceptable fit); Root mean square error of approximation <0.05 (good fit) and <0.08 (acceptable fit).

distribution of internal factor scores may differ from patients with MSK disorders who did not receive physical therapy or therapeutic education. Although the inclusion criteria for the participants in this study were established with the assumption that behavioral change due to therapeutic education would be assessed using the 25-JHLC scale, further examination of construct validity in a broader population would also be important.

The limitation of this study is that the validated population was limited to those with only MSK disorders and no comorbidities. While a high internal factor score may be expected to have a good prognosis if there are only MSK disorders, it is possible that a high internal factor score may not lead to a good prognosis for patients with serious comorbidities that require continuous support and medical treatment, for example. Therefore, the use of the 25-JHLC scale may be best limited at this time to the purpose of testing the effectiveness of therapeutic education in patients with MSK without comorbidities.

This study found some evidence of the structural validity of the 25-JHLC scale among Japanese people with MSK disorders without comorbidities.

Funding and Conflicts of interest

None.

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