

ORIGINAL ARTICLE

Pain Neurophysiology Knowledge Enhances Attitudes toward Biopsychosocial Management of Low Back Pain among Japanese Physical Therapists

Yuri Mikamo, PTS and Hiroshi Takasaki, PhD, RPT

Objectives: The aim of the current study was to investigate whether a postgraduate academic degree, longer clinical experience, and pain neurophysiology knowledge influence attitudes toward the balance between biomedical and biopsychosocial management of low back pain (LBP). **Methods:** Ninety Japanese physical therapists completed the revised Neurophysiology of Pain Questionnaire (revised NPQ), the Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT) questionnaire, and a survey on their degree qualifications and clinical experience. Their attitudes toward the balance between biomedical and biopsychosocial management of LBP were assessed using the mean biomedical scale scores divided by the mean biopsychosocial scale scores of the PABS-PT. Multiple regression modeling of the attitudes toward the balance between biomedical and biopsychosocial management of LBP was carried out using three independent variables: possession of an undergraduate or postgraduate academic degree, length of clinical experience, and the score on the revised NPQ. **Results:** Of the 90 therapists, 72 had an undergraduate degree and 18 also had a postgraduate degree. Only the revised NPQ score ($\beta=-0.364$, $P<0.001$) was a statistically significant contributing factor to attitudes toward the balance between biomedical and biopsychosocial management of LBP ($R^2=0.14$). Neither having a postgraduate degree ($\beta=0.017$, $P=0.871$) nor the length of clinical experience ($\beta=-0.107$, $P=0.303$) had a significant effect. **Conclusions:** This study demonstrated that pain neurophysiology knowledge, but not the possession of a postgraduate academic degree or the length of clinical experience, promotes attitudes toward biopsychosocial management of LBP among Japanese physical therapists.

Key Words: biomedical model; biopsychosocial model; education; physiotherapy

INTRODUCTION

The attitude of physical therapists toward the biopsychosocial management of low back pain (LBP) is important. A more pronounced biomedical orientation (indicating a belief that pain and disability result from a specific structural impairment and that treatment should be selected to address this impairment) negatively influences patient outcomes, resulting in less compliance with the clinical practice guidelines for LBP.¹⁻³⁾

In Japan, Takasaki et al.⁴⁾ found that therapists credentialed

in Mechanical Diagnosis and Therapy (MDT), an internationally standardized postgraduate clinical qualification, were more biopsychosocially oriented and less biomedically oriented than other physical therapists. It was also found that possession of a postgraduate academic degree was a contributing factor for compliance with clinical practice guidelines in examinations using established clinical vignettes.^{5,6)} Increasing knowledge of and skill in evidence-based practice in research activities during postgraduate education might contribute to levels of compliance with clinical practice guidelines. However, we questioned whether such academic

Received: May 26, 2021, Accepted: September 29, 2021, Published online: October 14, 2021

Department of Physical Therapy, Saitama Prefectural University, Saitama, Japan

Correspondence: Hiroshi Takasaki, PhD, RPT, Department of Physical Therapy, Saitama Prefectural University, Sannomiya 820, Koshigaya, Saitama 343-8540, Japan, E-mail: physical.therapy.takasaki@gmail.com

Copyright © 2021 The Japanese Association of Rehabilitation Medicine



This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives (CC BY-NC-ND) 4.0 License. <http://creativecommons.org/licenses/by-nc-nd/4.0/>

training alone is sufficient to modify the attitudes of physical therapists toward the biopsychosocial management of LBP, or if specific postgraduate clinical training is necessary to change attitudes and improve the quality of clinical practice in Japan.

Currently, the only supervisory criterion for clinical placement in physical therapy in Japan is the possession of at least 4 years of clinical experience. This indicates an assumption in Japanese physical therapy that the length of clinical experience is a contributing factor to the quality of clinical practice. However, it was found that the length of clinical experience of physical therapists who were educated in Japan was not associated with accuracy of estimating a patient's psychological status through physical evaluations⁷); in contrast, physical therapists with MDT clinical training are able to estimate a patient's psychological status through physical evaluations.⁸ Therefore, we wondered whether the length of clinical experience in physical therapy is a contributing factor in determining the attitude of physical therapists toward the biopsychosocial management of LBP.

Other factors, beside the possession of a postgraduate academic degree and the length of physical therapy clinical experience, could be associated with attitudes toward the biopsychosocial management of LBP. One possible factor could be the level of pain neurophysiology knowledge.^{9–11} Colleary et al⁹ conducted a two-arm randomized controlled trial among physical therapy students. The experimental group attended a 70-minute group lecture on pain neurophysiology education (PNE), which aimed to reconceptualize patient understanding of pain from a biomedical to a biopsychosocial perspective,¹² whereas the control group attended a 70-minute group lecture on red-flag signs and symptoms of LBP. The experimental group's post-lecture test results demonstrated lower scores on the Health Care Providers' Pain and Impairment Relationship Scale (HC-PAIRS).¹³ Because HC-PAIRS measures attitudes toward biomedical orientation for chronic LBP, this finding indicated that attitudes in the experimental group had changed toward less emphasis on biomedical treatment for chronic LBP. However, direct evidence is lacking to indicate whether greater pain neurophysiology knowledge among physical therapists is associated with greater emphasis on biopsychosocial treatment rather than on biomedical treatment. The Pain Attitudes and Beliefs Scale for Physiotherapists (PABS-PT)⁴ is a promising measure to further understand the balance between therapists' attitudes toward biomedical and biopsychosocial treatment orientations.

The current study aimed to investigate whether the posses-

sion of a postgraduate academic degree, the length of clinical experience, and the level of pain neurophysiology knowledge influence attitudes toward the balance between biomedical and biopsychosocial management of LBP among Japanese physical therapists.

MATERIALS AND METHODS

Data were collected via an online anonymous survey (SurveyMonkey, San Mateo, CA, USA) between July and August 2020. An online link to the survey presented on one of the author's (HT) personal webpage was added to the author's Facebook page, which was shareable with everyone. Inclusion criteria to take the survey were (1) possession of Japanese physical therapist credentials and (2) knowledge of Japanese as a native language. Participants completed the survey by judging for themselves that they satisfied the criteria. Ethical approval for this study was granted by the Institutional Research Ethics Committee of Saitama Prefectural University (#20011).

The survey included (1) demographic data (sex, age, academic degrees, and length of clinical experience), (2) the revised NPQ,¹⁴ and (3) the PABS-PT questionnaire.⁴ Academic degrees were categorized as undergraduate or postgraduate. The PABS-PT was developed to differentiate between a biomedical and a biopsychosocial treatment orientation with regard to LBP. The PABS-PT was originally developed in 2003¹⁵ and was revised in 2005 through construct validity investigations using exploratory factor analysis and criterion-related validity.¹⁶ The PABS-PT has a two-factor structure with a ten-item biomedical subscale and a nine-item behavioral subscale using a six-point Likert scale (1=totally disagree, 6=totally agree). Greater scores on each subscale indicate a stronger orientation toward biomedical or biopsychosocial treatment. In the current study, in accordance with a previous study,⁴ we calculated the mean of each subscale score and calculated the biomedical/behavioral ratio. A biomedical/behavioral ratio >1 indicates a stronger orientation toward biomedical treatment than toward biopsychosocial treatment, i.e., the clinician believes that disability and pain are a consequence of specific tissue pathology. Biomedical treatments are designed to treat these pathologies. A biomedical/behavioral ratio <1 indicates a stronger orientation toward biopsychosocial treatment than toward biomedical treatment, thereby indicating that the clinician believes that disability and pain are not necessarily a consequence of tissue damage and can be influenced by psychological and social factors. The revised NPQ measures the

Table 1. Characteristics and questionnaire results of the 90 participants

Variables	Participants (n = 90)
Age (years), mean (SD)	32.7 (7.1)
Sex (number of men), (%)	73 (81.1)
Degree level (number of those with undergraduate degree), (%)	72 (80.0)
Length of clinical experience (years), mean (SD)	9.6 (5.9)
Revised Neurophysiology of Pain Questionnaire (0–12), mean (SD)	6.7 (2.2)
Biomedical/behavioral ratio of the PABS-PT ^a , mean (SD)	0.9 (0.2)

PABS-PT, Pain Attitudes and Beliefs Scale for Physiotherapists.

^aA biomedical/behavioral ratio >1 indicates more emphasis on the biomedical treatment orientation than that of the biopsychosocial treatment orientation, whereas a biomedical/behavioral ratio <1 indicates more emphasis on the biopsychosocial treatment orientation than that of the biomedical treatment orientation.

Table 2. Results of multiple regression modeling for the biomedical/behavioral ratio of the Pain Attitudes and Beliefs Scale for Physiotherapists

Model	Unstandardized coefficients (B) (95% confidence intervals)	Standardized coefficients (β)	P-value
(Constant)	1.178 (0.861 to 1.495)		<0.001
Undergraduate or postgraduate degree	0.017 (−0.114 to 0.134)	0.017	0.871
Length of clinical experience	−0.004 (−0.013 to 0.004)	−0.107	0.303
Revised Neurophysiology of Pain Questionnaire score	−0.040 (−0.063 to −0.018)	−0.364	0.001

$R^2 = 0.16$, analysis of variance, $P = 0.002$.

level of pain neurophysiology knowledge and was originally developed in 2003¹⁷⁾ and revised in 2013 through construct validity investigations using Rasch analysis.¹⁸⁾ The NPQ is a unidimensional measure with 12 items having a three-level categorical scale (true, false, or undecided), wherein greater numbers of correct responses (i.e., true or false) indicate a higher level of pain neurophysiology knowledge.

There are diverse opinions regarding the minimum sample size compatible with regression modeling, with Jenkins et al.¹⁹⁾ and Pedhazur suggesting 25 and 15–30 subjects per predictor, respectively.²⁰⁾ Using Pedhazur's suggestion, the estimated sample size was set at 90 because our analysis included three independent variables (i.e., highest academic degree, length of clinical experience, and the revised NPQ score). Multiple regression analysis with the enter method was conducted with the biomedical/behavioral ratio of the PABS-PT subscales as the dependent variable. Independent variables with a correlation coefficient of >0.9 to the dependent variable were excluded from the model. Interpretation of the R^2 value was as follows: <0.3, none or a very weak effect size; 0.3–0.5, a weak or low effect size; 0.5–0.7, a moderate effect size; and >0.7, a strong effect size.²¹⁾ SPSS version 21.0 (IBM Corporation, New York, USA) was used for statistical analyses, with the statistical significance set at 5%. Descrip-

tive statistics were used to summarize the characteristics of the participants.

RESULTS

Complete datasets from 90 physical therapists were analyzed; the characteristics of the participants are shown in **Table 1**. None of the independent variables had a correlation coefficient with the dependent variable of >0.9. Consequently, all three independent variables were included in the analysis. The analysis indicated that only the revised NPQ score was a statistically significant contributing factor to the biomedical/behavioral ratio of the PABS-PT (**Table 2**). The analysis of variance was statistically significant. However, the R^2 value of 0.16 indicated a none or very weak effect size. The Durbin–Watson statistic was 2.20. There was one outlier wherein the measured value was more than 3 standard deviations from the predicted value.

DISCUSSION

We used a multiple regression model on data from a convenience sample of Japanese physical therapists to investigate how much the possession of a postgraduate academic

degree, the length of clinical experience, and the level of pain neurophysiology knowledge contribute to the biomedical/behavioral ratio of the PABS-PT subscales. Interestingly, the results showed that a higher level of pain neurophysiology knowledge (but not having a postgraduate academic degree or longer clinical experience) was a statistically significant contributing factor for a stronger orientation toward biopsychosocial treatment rather than toward biomedical treatment for LBP.

The absence of an effect of a postgraduate academic degree or the length of clinical experience on physical therapists' attitudes toward the balance between biomedical and biopsychosocial management of LBP is not surprising. A previous study⁴⁾ found that Japanese therapists credentialed in MDT placed more emphasis on the biopsychosocial treatment approach than Japanese physical therapists not credentialed in MDT. Therefore, post-graduate clinical training rather than postgraduate academic training in research activities would appear to be important in moving attitudes of physical therapists toward the biopsychosocial approach and thereby improving the quality of clinical practice in Japan.

The current study demonstrated that the level of pain neurophysiology knowledge correlated with more emphasis on the biopsychosocial treatment approach than on the biomedical treatment approach. This finding accords with the findings of previous studies among undergraduate students that used PNE as an experimental intervention and the HC-PAIRS score as the outcome.^{9,11)} Because pain is not a biological signal, but rather an output influenced by the patient's biopsychosocial status, enhancing the understanding of such biopsychosocially influenced mechanisms could be expected to contribute to moving attitudes toward the biopsychosocial management of LBP. When considering promising post-graduate clinical training for physical therapists, it is important to include PNE in the curriculum to develop physical therapists' attitudes toward the biopsychosocial treatment approach. PNE has been shown to be effective for reducing disability among selected patients.²²⁾ However, PNE could also be useful to enhance pain neurophysiology knowledge among novice physical therapists, resulting in more emphasis being placed on the biopsychosocial treatment approach.

The none-to-very-weak effect size of the regression model indicates that the revised NPQ could be a promising factor for modifying the biomedical/behavioral ratio in the PABS-PT; however, there are likely to be other contributing factors. When knowledge is an important factor, other contributing factors may include (1) attitudes toward evidence-based practice (EBP) and its application, which can be assessed

with a newly developed measure, the Health Sciences Evidence-Based Practice questionnaire²³⁾; (2) research experience²⁴⁾; (3) supportive environments to participate in research and facilitate EBP²⁵⁾; (4) attitudes toward exploring the literature²⁶⁾; and (5) the skills of EBP implementation, including skills for literature searching and interpreting the findings.²⁵⁾ Future studies will be needed to fully identify the contributing factors that change the attitudes of Japanese physical therapists toward the biopsychosocial management of LBP. It is worth noting that the PABS-PT has no cut-off score,²⁷⁾ and it is unclear at what point the PABS-PT score becomes an indicator of clinical best practice and how much changes in the PABS-PT score affect patient outcomes.²⁸⁾ Identifying a comprehensive model of factors contributing to patient outcomes will also be required.

The current study has some limitations. In particular, possible biases exist because of convenience sampling and the use of a social networking service. One is self-selection bias, where those with limited confidence in pain neurophysiology knowledge might not have wanted to participate in the study. The other is self-presentation bias, where those with confidence in pain neurophysiology knowledge or attitudes toward the biopsychosocial management of LBP might have chosen to participate in the study. Moreover, data were collected on a personal webpage and not through a physical therapy association. As a result, the physical therapy credentials for each participant were not confirmed. Further, we do not know what kind of special training for LBP management was received by each physical therapist who participated in the study or how frequently they treat patients with LBP, how confident they feel to aid or guide patients to manage their LBP, or how great was their compliance with LBP clinical practice guidelines. Therefore, a far larger cohort of Japanese physical therapist participants based on more robust sampling methods is required to fully identify the factors contributing to attitudes toward the biopsychosocial management of LBP.

In conclusion, this study demonstrated that increasing the level of pain neurophysiology knowledge, but not having a postgraduate academic degrees or longer clinical experience, enhances attitudes toward the biopsychosocial management of LBP among Japanese physical therapists.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

REFERENCES

1. Gardner T, Refshauge K, Smith L, McAuley J, Hübscher M, Goodall S: Physiotherapists' beliefs and attitudes influence clinical practice in chronic low back pain: a systematic review of quantitative and qualitative studies. *J Physiother* 2017;63:132–143. DOI:10.1016/j.jphys.2017.05.017, PMID:28655562
2. Darlow B, Fullen BM, Dean S, Hurley DA, Baxter GD, Dowell A: The association between health care professional attitudes and beliefs and the attitudes and beliefs, clinical management, and outcomes of patients with low back pain: a systematic review. *Eur J Pain* 2012;16:3–17. DOI:10.1016/j.ejpain.2011.06.006, PMID:21719329
3. Leysen M, Nijs J, Van Wilgen P, Demoulin C, Dankaerts W, Danneels L, Voogt L, Köke A, Pitance L, Roussel N: Attitudes and beliefs on low back pain in physical therapy education: a cross-sectional study. *Braz J Phys Ther* 2021;25:319–328. DOI:10.1016/j.bjpt.2020.08.002, PMID:32847758
4. Takasaki H, Saiki T, Iwasada Y: McKenzie therapists adhere more to evidence-based guidelines and have a more biopsychosocial perspective on the management of patients with low back pain than general physical therapists in Japan. *Open J Ther Rehabil* 2014;02:173–181. DOI:10.4236/ojtr.2014.24023
5. Evans DW, Breen AC, Pincus T, Sim J, Underwood M, Vogel S, Foster NE: The effectiveness of a posted information package on the beliefs and behavior of musculoskeletal practitioners: the UK Chiropractors, Osteopaths, and Musculoskeletal Physiotherapists Low Back Pain Management (COMPLEMENT) randomized trial. *Spine* 2010;35:858–866. DOI:10.1097/BRS.0b013e3181d4e04b, PMID:20308941
6. Evans DW, Foster NE, Underwood M, Vogel S, Breen AC, Pincus T: Testing the effectiveness of an innovative information package on practitioner reported behaviour and beliefs: the UK Chiropractors, Osteopaths and Musculoskeletal Physiotherapists Low back pain Management (COMPLEMENT) trial [ISRCTN77245761]. *BMC Musculoskelet Disord* 2005;6:41. DOI:10.1186/1471-2474-6-41, PMID:16033646
7. Miki T, Kondo Y, Takebayashi T, Takasaki H: Difference between physical therapist estimation and psychological patient-reported outcome measures in patients with low back pain. *PLoS One* 2020;15:e0227999. DOI:10.1371/journal.pone.0227999, PMID:31961900
8. Suzuki K, Takasaki H: Ability of therapists trained in Mechanical Diagnosis and Therapy to guess pain catastrophizing and kinesiophobia scores for patients with low back pain. *Open J Ther Rehabil* 2020;08:119–130. DOI:10.4236/ojtr.2020.84011
9. Colleary G, O'Sullivan K, Griffin D, Ryan CG, Martin DJ: Effect of pain neurophysiology education on physiotherapy students' understanding of chronic pain, clinical recommendations and attitudes towards people with chronic pain: a randomised controlled trial. *Physiotherapy* 2017;103:423–429. DOI:10.1016/j.physio.2017.01.006, PMID:28797666
10. Carroll SP, Augeard N, Tennant J, Seenan C: How do the attitudes, confidence, knowledge and understanding differ in pre-registration healthcare students towards treating people with chronic pain: an observational, cross-sectional study. *Eur J Physiother.* (In Press)
11. Mankelov J, Ryan C, Taylor P, Martin D: The effect of pain neurophysiology education on healthcare students' knowledge, attitudes and behaviours towards pain: a mixed-methods randomised controlled trial. *Musculoskelet Sci Pract* 2020;50:102249. DOI:10.1016/j.msksp.2020.102249, PMID:32920228
12. Moseley GL, Butler DS: Fifteen years of explaining pain: the past, present, and future. *J Pain* 2015;16:807–813. DOI:10.1016/j.jpain.2015.05.005, PMID:26051220
13. Rainville J, Bagnall D, Phalen L: Health care providers' attitudes and beliefs about functional impairments and chronic back pain. *Clin J Pain* 1995;11:287–295. DOI:10.1097/00002508-199512000-00006, PMID:8788576
14. Mine K, Gilbert S, Tsuchiya J, Nakayama T: The short-term effects of a single lecture on undergraduate physiotherapy students' understanding regarding pain neurophysiology: a prospective case series. *J Musculoskelet Disord Treat* 2017;3:1–6.
15. Ostelo RW, Stomp-van den Berg SG, Vlaeyen JW, Wolters PM, de Vet HC: Health care provider's attitudes and beliefs towards chronic low back pain: the development of a questionnaire. *Man Ther* 2003;8:214–222. DOI:10.1016/S1356-689X(03)00013-4, PMID:14559044
16. Houben RM, Ostelo RW, Vlaeyen JW, Wolters PM, Peters M, Berg SG: Health care providers' orientations towards common low back pain predict perceived harmfulness of physical activities and recommendations regarding return to normal activity. *Eur J Pain* 2005;9:173–183. DOI:10.1016/j.ejpain.2004.05.002, PMID:15737810

17. Moseley L: Unraveling the barriers to reconceptualization of the problem in chronic pain: the actual and perceived ability of patients and health professionals to understand the neurophysiology. *J Pain* 2003;4:184–189. DOI:10.1016/S1526-5900(03)00488-7, PMID:14622702
18. Catley MJ, O'Connell NE, Moseley GL: How good is the neurophysiology of pain questionnaire? A Rasch analysis of psychometric properties. *J Pain* 2013;14:818–827. DOI:10.1016/j.jpain.2013.02.008, PMID:23651882
19. Jenkins DG, Quintana-Ascencio PF: A solution to minimum sample size for regressions. *PLoS One* 2020;15:e0229345. DOI:10.1371/journal.pone.0229345, PMID:32084211
20. Pedhazur EJ: Multiple regression in behavioral research: explanation and prediction. 3rd ed. Harcourt Brace, Orlando, 1997.
21. Moore DS, Notz W, Fligner MA: The basic practice of statistics. WH Freeman and Company, New York, 2013.
22. Nijs J, De Kooning M, Malfliet A, Jones MA: Applying contemporary pain neuroscience for a patient with maladaptive central sensitization pain. In: Jones MA, Rivett D, editors. *Clinical Reasoning in Musculoskeletal Practice*. 2nd ed. London: Elsevier; 2019. pp. 455–470.
23. Fernández-Domínguez JC, de Pedro-Gómez JE, Morales-Asencio JM, Bannasar-Veny M, Sastre-Fullana P, Sesé-Abad A: Health Sciences-Evidence Based Practice questionnaire (HS-EBP) for measuring transprofessional evidence-based practice: creation, development and psychometric validation. *PLoS One* 2017;12:e0177172. DOI:10.1371/journal.pone.0177172, PMID:28486533
24. Tomotaki A, Fukahori H, Sakai I: Exploring sociodemographic factors related to practice, attitude, knowledge, and skills concerning evidence-based practice in clinical nursing. *Jpn J Nurs Sci* 2020;17:e12260. DOI:10.1111/jjns.12260, PMID:31173465
25. Fujimoto S, Kon N, Takasugi J, Nakayama T: Attitudes, knowledge and behavior of Japanese physical therapists with regard to evidence-based practice and clinical practice guidelines: a cross-sectional mail survey. *J Phys Ther Sci* 2017;29:198–208. DOI:10.1589/jpts.29.198, PMID:28265139
26. Takasaki H, Elkins MR, Moseley AM: Use of the Physiotherapy Evidence Database (PEDro) in Japan. *Phys Ther Res* 2016;19:58–66. DOI:10.1298/ptr.E9881, PMID:28289582
27. Mutsaers JH, Peters R, Pool-Goudzwaard AL, Koes BW, Verhagen AP: Psychometric properties of the Pain Attitudes and Beliefs Scale for Physiotherapists: a systematic review. *Man Ther* 2012;17:213–218. DOI:10.1016/j.math.2011.12.010, PMID:22277324
28. Overmeer T, Boersma K, Denison E, Linton SJ: Does teaching physical therapists to deliver a biopsychosocial treatment program result in better patient outcomes? A randomized controlled trial. *Phys Ther* 2011;91:804–819. DOI:10.2522/ptj.20100079, PMID:21451098