Psychological Treatment Strategy for Chronic Low Back Pain

Tatsunori Ikemoto\(^1\), Kenji Miki\(^2\), Takako Matsubara\(^3\) and Norimitsu Wakao\(^5\)

1) Department of Orthopedic Surgery, Aichi Medical University, Nagakute, Japan
2) Center for Pain, Hayaishi Hospital, Osaka, Japan
3) Department of Physical Therapy, Faculty of Rehabilitation, Kobe Gakuin University, Kobe, Japan
4) Pain Medicine & Research Information Center, nonprofit organization, Aichi, Japan
5) Spine Center, Aichi Medical University Hospital, Nagakute, Japan

Abstract:
Studies have indicated that chronic low back pain (LBP) should be approached according to its morphological basis and in consideration of biopsychosocial interventions. This study presents an updated review on available psychological assessments and interventions for patients with chronic LBP. Psychosocial factors, including fear-avoidance behavior, low mood/withdrawal, expectation of passive treatment, and negative pain beliefs, are known as risk factors for the development of chronic LBP. The Örebro Musculoskeletal Pain Questionnaire, STarT Back Screening Tool, and Brief Scale for Psychiatric Problems in Orthopaedic Patients have been used as screening tools to assess the development of chronicity or identify possible psychiatric problems. The Pain Catastrophizing Scale, Pain Self-Efficacy Questionnaire, and Injustice Experience Questionnaire are also widely used to assess psychosocial factors in patients with chronic pain. With regard to interventions, the placebo effect can be enhanced by preferable patient-clinician relationship. Reassurance to patients with non-specific pain is advised by many guidelines. Cognitive behavioral therapy focuses on restructuring the negative cognition of the patient into realistic appraisal. Mindfulness may help improve pain acceptance. Self-management strategies with appropriate goal setting and pacing theory have proved to improve long-term pain-related outcomes in patients with chronic pain.

Keywords:
Chronic pain, Low back pain, Psychosocial strategy

Introduction
Low back pain (LBP) is a major public health problem worldwide. Diagnosing the cause of LBP, which is usually defined as pain localized below the costal margin and above the inferior gluteal folds, is essential to the triage of patients with specific or non-specific LBP\(^5\). Regardless of the established guideline for treating LBP\(^5\), approximately 5% to 10% of LBP may develop into chronic conditions after various interventions\(^2\)-\(^4\). Studies using imaging to identify the morphological pathology of LBP have reported high rates of false-positive results\(^9\). Inoue et al. reported that approximately 20% patients who underwent lumbar surgery have residual symptoms, among which pain is the most prevalent\(^6\). A recent report in Japan has indicated that psychosocial factors are critical to the development of chronic, disabling LBP\(^7\). As such, chronic LBP should be approached by considering not only its morphological basis but also its biopsychosocial interventions\(^8\)-\(^10\).

Brox et al. reported that lumbar fusion surgery for chronic LBP after a previous surgery is no more effective than cognitive intervention\(^11\), indicating that clinicians should recognize the importance of biopsychosocial interventions and identify the fundamental technique for treating patients with chronic LBP. However, few facilities in Japan can provide biopsychosocial interventions for chronic pain, and thus, the standard technique of psychological intervention for chronic pain seems to be lacking among Japanese clinicians\(^12\). In the present work, we present an updated review as keynote on the available psychological assessments and interventions for patients with chronic LBP.
Table 1. Screening Tool of Psychosocial Factors Associated with Chronic Low Back Pain.

| Questionnaire (abbreviation) | Evaluation issues | Interpretation |
|-----------------------------|------------------|----------------|
| **Örebro Musculoskeletal Pain Questionnaire (ÖMPQ)** | Psychosocial factors | A total score ≥ 114 indicates high risk of chronicity |
| ÖMPQ original 21-item | | A total score ≥ 72 indicates high risk of chronicity |
| ÖMPQ-12 short form | | A total score ≥ 4 with a psychosocial score ≥ 4 is high-risk of chronicity |
| **StarT Back Screening Tool** | Psychosocial factors | Possible psychiatric problem: |
| Brief Scale for psychiatric problem in Orthopaedic Patients (BS-POP) | Psychiatric problems | A score ≥ 11 physician version points |
| | | or A score ≥ 10 physician version points with a score ≥ 15 patient version points. |
| Pain catastrophizing scale (PCS) | Catastrophic thought for pain | Higher score indicates having higher catastrophizing thoughts (negative outcome). |
| Injustice Experience Questionnaire (IEQ) | Feeling of Injustice | Higher score indicates having higher injustice feelings (negative outcome). |
| Pain Self-Efficacy Questionnaire (PSEQ) | Self-confidence to cope with pain | Higher score indicates having higher self-confidence (positive outcome). |

**Psychological Treatment Strategy**

1. Assessment of physical problems and disabilities

Prior to psychological assessment, it is essential for the clinicians to reevaluate physical problems to avoid overlooking red flags or organic diseases. Nonetheless, it seems inevitable that diagnostic errors often occur because of cognitive biases, such as availability, representativeness, confirmation bias, and premature disclosure. For example, although vertebral fracture is one of prevalent causes of LBP, it is often overlooked. An early intervention for osteoporosis with fragile vertebral fractures can be useful for preventing the development of chronic LBP. While treatable organic diseases are sufficiently intervened, clinicians simultaneously need to assess the disabilities and quality of life (QOL) of patients with chronic LBP because improvements in disabilities are considered an important outcome among chronic pain patients. The Roland Morris Disability Questionnaire, Oswestry Disability Index, and Pain Disability Assessment Scale are often used as assessment tools regarding disabilities in patients with chronic LBP.

2. Assessment of psychological risk factors

Psychosocial factors, including fear-avoidance behavior, low mood/withdrawal, expectation of passive treatment, and negative pain beliefs such as catastrophizing, have been known to be risk factors for the development of chronic LBP, also known as “yellow flags” (Table 1). Linton et al. introduced the Örebro Musculoskeletal Pain Questionnaire (ÖMPQ) to assess psychosocial factors associated with acute LBP, and this questionnaire has been shown to be effective in predicting LBP chronicity. As for a Japanese version of ÖMPQ, a short version of ÖMPQ was recently introduced. In terms of clinical cut-off point, a total score of ≥72 in the ÖMPQ-12 short form or ≥114 in the ÖMPQ original 21-item form indicates a high risk of absenteeism or functional impairment, respectively. Alternatively, Hill et al. introduced the Keele StarT Back Screening Tool to identify prognostic indicators to classify patients with poor prognoses. A stratified approach using this screening was associated with a mean increase in generic health and cost savings. Matsuda et al. evaluated the validity of the Japanese version of StarT Back Screening (StarT-J) in patients with LBP, and they reported the efficacy of StarT-J in predicting pain and disability outcomes after six months in patients with LBP. This tool classifies patients into three risk groups based on scores on nine overall items and five psychosocial subscales as follows: the low-, medium-, and high-risk groups for those earning the total scores of 0-3, ≥4 (and psychosocial score of ≤3), and ≥4 (and psychosocial score of ≥4), respectively. For patients in the high-risk group, cognitive behavioral therapy (CBT), in combination with physical therapy, is recommended.

In addition, pain catastrophizing, pain coping skills, self-efficacy, and perceived injustice are known to be important psychometric properties associated with pain-related outcomes in patients with chronic pain, and over 1,000 international studies have documented a relationship between pain catastrophizing and adverse pain outcomes. The Pain Catastrophizing Scale (PCS), Pain Self-Efficacy Questionnaire (PSEQ), and Injustice Experience Questionnaire (IEQ) are widely used to assess the psychosocial aspects of chronic pain patients worldwide, and their Japanese versions have been introduced and validated.

Meanwhile, traditional psychiatric problems, such as anxiety and depression, are well known to be associated with sustained LBP. Japanese orthopedic physicians have originally proposed the Brief Scale for Psychiatric problems in Orthopaedic Patients (BS-POP) to assess psychiatric problems in patients with LBP. BS-POP includes questionnaires for both physicians and patients, and its clinical cut-off point to suspect psychiatric problem is set at ≥11 physician version points and ≥10 physician version points with ≥...
15 patient version points. Orthopedic surgeons are recommended to consult with a psychiatrist when a patient has a high BS-POP score; a multidisciplinary approach is also considered wise.

3. Psychotherapeutic approach

(1) Patient-clinician relationship and clinician’s attitude

Patient-clinician relationship, particularly rapport building, plays an important role in treatment outcomes in patients with chronic pain. A recent review implied that the placebo effect can be enhanced by patient-clinician relationship. Patient satisfaction is positively associated with affiliative behaviors, such as forward-leaning posture, smiling, nodding, and a relatively high-pitched vocal tone, and negatively associated with physician control. Patient-centered support, including psychological support, promotion of patient’s health literacy, and empowerment of patients to cooperate in finding the correct treatment, can increase the resilience of patient with chronic pain. Clinicians’ empathy has an important role to influence outcome in patients with chronic pain. An experimental study showed that participants who stated feeling more trust toward their clinician reported less pain in response to painful stimuli, suggesting that trustworthiness can be an important factor to positive outcomes in patients with chronic pain.

(2) Reassurance

Reassurance is the removal of fears and concerns in patients with illness. Many guidelines advice the delivery of reassurance to patients with non-specific pain, including LBP. The concept of reassurance aligns with the fear-avoidance model: excessive worry for pain leads patients into a vicious circle of chronic pain. Fincus et al. proposed a theoretical model of reassurance comprising affective and cognitive components. Affective reassurance aims to build patient-clinician relationship, which is associated, at best, with improved short-term outcomes, and at worst, with poorer outcomes. By contrast, cognitive reassurance aims to improve the patient’s knowledge and understanding of their health problem for reducing their worries, which can improve outcomes in both the short and long term.

(3) Cognitive behavioral therapy (CBT)

CBT, a form of psychological therapy, has been widely utilized in the treatment of chronic LBP. In recent trend of behavioral medicine intervention, CBT has been recognized as a second-generation behavioral therapy. According to a recent systematic review, CBT significantly improves disability and pain catastrophizing in patients with chronic pain after treatment and at follow-up. As negative and catastrophic thoughts are highly correlated to pain complaints, CBT focuses on restructuring the negative cognition of the patient into a realistic appraisal. When a realistic appraisal can be gained, the patient may be able to cope with their pain. For example, in patients with chronic LBP with unidentified pathologies, a patient’s negative thought of “Pain lasts for several months, but no treatment works for me, and so I feel awful” can be replaced by “I had many experiences of this kind of pain, but my body has been working well and I could get through every time” (Fig. 1). However, these educational suggestions should be provided by skilled practitioners with abundant CBT experience. Otherwise, insufficient technique may cause a broken relationship between the patient and the clinician. Meanwhile, homework assignments between therapy sessions are an essential component of CBT. Homework should start with easy items at the first stage to build up confidence. Otherwise, patients may be discouraged and would not participate in further therapy.
(4) Acceptance and commitment therapy (ACT) and mindfulness

A third-generation behavior therapy is called acceptance and commitment therapy (ACT) and is used increasingly for treating chronic pain. ACT focuses in particular on the concepts of acceptance, and mindfulness. The general understanding of mindfulness meditation or mindfulness interventions is represented by the following: “close your eyes for about a minute and maintain an open awareness of the sensations of breathing at your nostrils. There is no need to do anything special, just continuously observe the sensations of breathing in and breathing out at the nostrils with curiosity and interest.” Mindfulness has been associated with a small effect of improved pain symptoms compared with control treatment for chronic pain in a meta-analysis of 30 randomized controlled trials; however, there was substantial heterogeneity among these studies. Moreover, although there are plenty of papers addressing the effect of mindfulness on chronic LBP, its efficacy on pain-related outcomes has not been conclusive; there is limited evidence that it can improve pain acceptance. Mindfulness intervention may be similar to pain desensitization, as meditation exposes subjects to painful sensations by removing catastrophic thoughts. As a consequence, repeated practice can enhance tolerance for negative emotions. A current neuroimaging study has indicated that specific brain regions, such as the medial prefrontal cortex and posterior cingulate cortex, are involved in the self-referential process during meditation.

(5) Encouragement of self-management

Self-management is considered an important strategy for patients with chronic illness. In terms of chronic pain, a number of pain intervention programs based on this concept have consistently shown improvements in treatment outcomes. Confidence in ability to perform specified activities (or self-efficacy belief) has been correlated with the subsequent performance of those activities in patients with chronic LBP. A well-established self-management program for chronic pain, called ADAPT program, proposed appropriate “goal setting” and “pacing,” adding to the above strategies, to make the program achievable. In goal setting, patients need to identify what they achieve in their life, and what changes are important to them. The goal should be divided into short- and long-term goals, and they must be realistic, achievable, relevant, and specific (Fig. 2). In addition, when the pain is less, patients are more active, but when the pain is worse, they do less and rest more. The main problem is that they will do less and less. For appropriate pacing, activity should be increased stepwise based on planned targets and not the degree of pain. Simultaneously, other strategies mentioned above help the patient get through and build the confidence to cope with pain.

Discussion

Negative perception to self-behavior could be associated with mortality. It is proposed that physiological pain with organic insult can have negative effects on emotions and
cognitive function, and conversely, a negative emotional state can lead to increased pain through the central pain pathway (e.g., noxious neuronal signal to the anterior cingulate cortex)\(^8\). Many chronic low back pain have both organic and psychological factors\(^9\). Therefore, people with chronic pain usually suffer from not only pain but also overlapping problems, such as depression, anxiety, sleep disorders, working with disabilities, drug overuse, and low quality of life\(^7,8\). Thus, biopsychosocial treatment, which can be substituted by a multidisciplinary approach, is becoming an essential strategy for treating chronic pain\(^9\). A multidisciplinary approach is commonly a well-organized program that consists of the psychological strategies mentioned above, based on the opinion that none of all approaches to the treatment of chronic pain has a stronger evidence basis for efficacy, cost-effectiveness, and lack of iatrogenic complications than multidisciplinary approach\(^9\).

The aim of the present updated review is to introduce the psychological key concepts to clinical practitioners. Indeed, multidisciplinary approaches have succeeded in yielding improvements to pain-related outcomes in patients with chronic pain in Japan, most of which were LBP\(^7,8\). However, regardless of the essential relationship between psychological factors and chronic LBP\(^8\), there are few facilities that provide a multidisciplinary approach on chronic pain in Japan.

Several reasons might explain why this issue remains unresolved in Japan. First, the psychologist cannot play a role of clinician in Japanese medical administration and insurance system. Although psychotherapeutic treatment by a psychologist needs the instruction of a psychiatrist, most psychologists seldom have an interest to treat patients with chronic LBP, and they prefer pharmacotherapy over psychotherapy. Second, in addition to the non-independence of the psychologist, psychotherapeutic studies as medical intervention have lagged behind those in Western countries. In fact, Ono et al. recently reported that while CBT for depression, anxiety disorder, post-traumatic stress disorder, obsessive-compulsive disorder, and personality disorder has been studied, randomized control studies of psychotherapy are seldom conducted in Japan\(^7\). Indeed, the present review did not find psychotherapeutic studies for chronic pain. It was only in 2014 when a research group at the Japanese Agency for Medical Research and Development in Japan began to establish evidence for the efficacy of CBT on chronic pain in the country\(^8\). Third, although most patients with chronic musculoskeletal pain in Japan are initially treated at orthopedic facilities\(^9\), educational categories for specialists approved by the Japanese Orthopaedic Association consist of basic science, musculoskeletal diseases based on morphological pathologies, rehabilitation, and medical ethics and safety. They do not include pain education, particularly psychological strategies, indicating that standard techniques in the management of chronic pain are poorly shared among orthopedic physicians. On the other hand, we have to consider limitations of the psychotherapeutic approaches. Although CBT and mindfulness are very useful strategies for treating chronic pain, they should be avoided to prevent form organic insults along with a disease progression when treatable pathophysiology remains as causes of chronic pain. Therefore, an updated biomedical knowledge is also required in the psychotherapeutic approaches for chronic LBP.

As these strategies can apply to older people with chronic pain\(^8,9\), widespread dissemination would be expected for Japan’s aging society.

**Conflicts of Interest:** The authors declare that there are no relevant conflicts of interest.

**Author Contributions:** All authors have substantially contributed to this review article including concept, collection of references, and preparation of manuscript.

All authors have approved the final version to be published in Spine Surgery and Related Research.

**References**

1. Koës BW, van Tulder M, Lin CW, et al. An updated overview of clinical guidelines for the management of non-specific low back pain in primary care. Eur Spine J. 2010;19(12):2075-94.

2. Liao ZT, Pan YF, Huang JL, et al. An epidemiological survey of low back pain and axial spondyloarthritides in a Chinese Han population. Scand J Rheumatol. 2009;38(6):455-9.

3. Loisel P, Lemaire J, Poitras S, et al. Cost-benefit and cost-effectiveness analysis of a disability prevention model for back pain management: a six year follow up study. Occup Environ Med. 2002;59(12):807-15.

4. Melloh M, Röder C, Elfering A, et al. Differences across health care systems in outcome and cost-utility of surgical and conservative treatment of chronic low back pain: a study protocol. BMC Musculoskelet Disord. 2008;9:81.

5. Kalichman L, Kim DH, Li L, et al. Computed tomography-evaluated features of spinal degeneration: prevalence, intercorrelation, and association with self-reported low back pain. Spine J. 2010;10(3):200-8.

6. Inoue S, Kamiya M, Nishihara M, et al. Prevalence, characteristics, and burden of failed back surgery syndrome: the influence of various residual symptoms on patient satisfaction and quality of life as assessed by a nationwide Internet survey in Japan. J Pain Res. 2017;10:811-23.

7. Matsudaïka K, Kawaguchi M, Isomura T, et al. Assessment of psychosocial risk factors for the development of non-specific chronic disabling low back pain in Japanese workers-findings from the Japan Epidemiological Research of Occupation-related Back Pain (JOB) study. Ind Health. 2015;53(4):368-77.

8. Kikuchi S. New concept for backache: biopsychosocial pain syndrome. Eur Spine J. 2008;17 Suppl 4:421-7.

9. Kikuchi S. The Recent Trend in Diagnosis and Treatment of Chronic Low Back Pain. Spine Surg Relat Res. 2017;1(1):1-6.

10. Kamper SJ, Apeldoorn AT, Chiarotto A, et al. Multidisciplinary biopsychosocial rehabilitation for chronic low back pain. Cochrane Database Syst Rev. 2014 Sep 2;(9):CD000963.

11. Brox I, Reikerås O, Nygaard Ø, et al. Lumbar instrumented fusion compared with cognitive intervention and exercises in patients with chronic back pain after previous surgery for disc herniation: a prospective randomized controlled study. Pain. 2006;122(1-2):145-55.

12. Ikemoto T, Arai YC, Nishihara M, et al. Strategies for managing...
chronic pain: Case of a skilled orthopaedic physician and mini-review. Open J Orthop. 2015;5:109-14.

13. Norman G. Dual processing and diagnostic errors. Adv Health Sci Educ Theory Pract. 2009;14 Suppl 1:37-49.

14. Panda A, Das CJ, Barah U. Imaging of vertebral fractures. Indian J Endocrinol Metab. 2014;18(3):295-303.

15. Karunanayake AL, Pathmeswaran A, Wijayaratne LS. Chronic low back pain and its association with lumbar vertebrae and intervertebral disc changes in adults. A case control study. Int J Rheum Dis. 2018;21(3):602-10.

16. Turk DC, Dworkin RH, Allen RR, et al. Core outcome domains for chronic pain clinical trials: IMMPACT recommendations. Pain 2003;106(3):337-45.

17. Roland M, Morris R. A study of the natural history of low-back pain. Part II: development of guidelines for trials of treatment in primary care. Spine. 1983 Mar;8(2):145-50.

18. Suzukamo Y, Fukuhara S, Kikuchi S, et al.; Committee on Science Project, Japanese Orthopaedic Association. Validation of the Japanese version of the Roland-Morris Disability Questionnaire. J Orthop Sci. 2003;8(4):543-8.

19. Fairbank JC, Couper J, Davies JB, et al. The Oswestry low back pain disability questionnaire. Physiotherapy. 1980 Aug;66(8):271-3.

20. Fujiwara A, Kobayashi N, Saiki K, et al. Association of the Japanese Orthopaedic Association score with the Oswestry Disability Index, Roland-Morris Disability Questionnaire, and short-form 36. Spine. 2003;28(14):1601-7.

21. Yamashiro K, Arimura T, Iwaki R, et al. A multidimensional measure of pain interference: Reliability and validity of the pain disability assessment scale. Clin J Pain 2011;27(4):338-43.

22. Arimura T, Komiyama H, Hosoi M. Pain disability assessment scale: a simplified scale for clinical use. Jpn J Behav Ther 1997;23:7-15. (in Japanese)

23. Kendall NAS, Linton SJ, Main CJ. Guide to assessing psychosocial yellow flags in acute low back pain: Risk factors for long-term disability and work loss. Wellington, NZ: ACC; 1997.

24. Linton SJ, Boersma KMA. Early identification of patients at risk of developing a persistent back problem: The predictive validity of The Orobro Musculoskeletal Pain Questionnaire. Clin J Pain. 2003;19:80-6.

25. Pincus T, Burton AK, Vogel S, et al. A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain. Spine. 2002;27:E109-20.

26. Westman A, Linton SJ, Ohvrik J, et al. Do psychosocial factors predict disability and health at a 3-year follow-up for patients with non-acute musculoskeletal pain? A validation of the Orobro Musculoskeletal Pain Screening Questionnaire. Eur J Pain. 2008;12(5):641-9.

27. Takasaki H, Gabel CP. Cross-cultural adaptation of the 12-item Orobro musculoskeletal screening questionnaire to Japanese (ÖMSQ-12-J), reliability and clinicians’ impressions for practicality. J Phys Ther Sci. 2017;29(8):1409-15.

28. Gabel CP, Burkett B, Melloh M. The shortened Orobro Musculoskeletal Screening Questionnaire: evaluation in a work-injured population. Man Ther. 2013;18(5):378-85.

29. Gabel CP, Melloh M, Burkett B, et al. The Orobro Musculoskeletal Screening Questionnaire: validation of a modified primary care musculoskeletal screening tool in an acute work injured population. Man Ther. 2012;17(6):554-65.

30. Hill JC, Dunn KM, Main CJ, et al. Subgrouping low back pain: a comparison of the STarT Back Tool with the Orobro Musculoskeletal Pain Screening Questionnaire. Eur J Pain. 2010;14:83-9.

31. Hill JC, Whitehurst DG, Lewis M, et al. Comparison of stratified primary care management for low back pain with current best practice (STarT Back): a randomised controlled trial. Lancet. 2011;378(9802):1560-71.

32. Matsudaira K, Oka H, Kikuchi N, et al. Psychometric Properties of the Japanese Version of the STarT Back Tool in Patients with Low Back Pain. PLoS One. 2016;11(3):e0152019.

33. Matsudaira K, Kikuchi N, Kawaguchi M, et al. Development of a Japanese version of the STarT (Subgrouping for Targeted Treatment) Back screening tool: translation and linguistic validation. Journal of Musculoskeletal Pain Research. 2013;5:11-9. (Japanese)

34. Matsudaira K, Oka H, Kikuchi N, et al. The Japanese version of the STarT Back Tool predicts 6-month clinical outcomes of low back pain. J Orthop Sci. 2017;22(2):224-9.

35. Foster NE, Mullis R, Hill JC, et al. IMpACT Back Study team. Effect of stratified care for low back pain in family practice (IM-PaCT Back): a prospective population-based sequential comparison. Ann Fam Med. 2014;12(2):102-11.

36. Sullivan MJ, Thorn B, Haythornthwaite JA, et al. Theoretical perspectives on the relation between pain catastrophizing and pain. Clin J Pain 2001;17:52-64.

37. Asghari A, Nicholas MK. Personaliy and pain-related beliefs/copings strategies: a prospective study. Clin J Pain. 2006;22(1):10-8.

38. Sullivan MJL, Adams H, Horan S, et al. The role of perceived injustice in the experience of chronic pain and disability: Scale development and validation. J Occup Rehabil. 2008;18(3):249-61.

39. Sullivan MJ. What is the clinical value of assessing pain-related psychosocial risk factors? Pain Manag. 2013;3(6):413-6.

40. Sullivan MJL, Bishop S, Pivik J. The Pain Catastrophizing Scale: development and validation. Psychol Assess 1995;7:432-524.

41. Nicholas MK. The pain self-efficacy questionnaire: Taking pain into account. Eur J Pain. 2007;11(2):153-63.

42. Iwaki R, Arimura T, Jensen MP, et al. Global catastrophizing vs catastrophizing subdomains: assessment and associations with patient functioning. Pain Med. 2012;13(5):677-87.

43. Matsuoka H, Sakano Y. Assessment of cognitive aspect of pain: Development, reliability, and validation of Japanese version of Pain Catastrophizing Scale. Jpn J Psychosom Med 2007;47:95-102. (Japanese).

44. Adachi T, Nakae A, Maruo T, et al. Validation of the Japanese version of the pain self-efficacy questionnaire in Japanese patients with chronic pain. Pain Med. 2014;15(8):1405-17.

45. Yamada K, Adachi T, Mibu A, et al. Injustice Experience Questionnaire, Japanese Version: Cross-Cultural Factor-Structure Comparison and Demographics Associated with Perceived Injustice. PLoS One. 2016;11(8):e0160567.

46. Pincus T, Burton AK, Vogel S, et al. A systematic review of psychologcal factors as predictors of chronicity/disability in prospective cohorts of low back pain. Spine. 2002;27:E109-20.

47. Watanabe K, Kikuchi S, Konno S, et al. Brief scale for psychiatric problems in orthopaedic patients (BS-POP) validation study. Rinshou Seikeigeka (Clin Orthop Surg). 2005;40:745-51 (Japanese).

48. Yoshida K, Sekiguchi M, Otani K, et al. A validation study of the Brief Scale for Psychiatric problems in Orthopaedic Patients (BS-POP) for patients with chronic low back pain (verification of reliability, validity, and reproducibility). J Orthop Sci. 2011;16(1):7-13.

49. Bieber C, Muller KG, Blumenstiel K, et al. Long-term effects of a shared decision-making intervention on physician-patient interaction and outcome in fibromyalgia. A qualitative and quantitative 1 year follow-up of a randomized controlled trial. Patient Educ Couns. 2006;63(3):357-66.
from training in self-management of chronic pain in an elderly population: a randomized controlled trial. Pain. 2017;158(1):86-95.