The Optimal Screening for Prediction of Referral and Outcome Yellow Flag (OSPRO-YF) tool for assessing pain-associated psychological distress in orthopedic physical therapy practice

Clinical Pearls

- The Optimal Screening for Prediction of Referral and Outcome (OSPRO) Yellow Flag (OSPRO-YF) tool[1] can be administered to assess for "yellow flags"[2] throughout physical therapy care, including on evaluation, at discharge, and at regular intervals between those two time points.[3]
- Applications of the OSPRO-YF tool include:
    - Predicting outcomes [4-9] and refining risk asssesments[8]
    - Identifying multiple constructs of pain-associated psychological distress.[1]
    - Phenotyping pain-associated psychological distress.[10-13]
    - Matching treatment to risk profile, distress phenotype, and/or underlying psychosocial mechanism[14]
    - Assessing change[3,5,7-9]
- Administering a unidimensional tool such as the Pain Catastrophizing Scale[15] subsequent to the OSPRO-YF tool may further detail a patient's pain profile.[3,16]

Introduction

In physical therapy practice, "yellow flags"[2] are markers of pain-associated psychological distress and are often exemplified by maladaptive beliefs, appraisals, judgements, emotional responses, pain behaviors, and coping strategies.[17] Pain-associated psychological distress is also predictive of adverse pain outcomes[18-21] and is associated with increased pain,[10,22] disability,[10,22] and duration of sickness absence from work.[23] To manage the risk associated with pain-associated psychological distress, authors recommend routine standardized screening for yellow flags in physical therapy care,[3,11,17,24,25] which may include administering screening instruments. Authors suggest this is effective in identifying relevant psychological factors[26] and that, without formal screening, a clinician's ability to determine the presence of psychological distress is limited.[3,24,27] There is currently no 'gold standard' screening instrument for yellow flags, which physical therapists may find advantageous – upon identifying instruments that are psychometrically sound, they may choose one – or a combination of several – that are most practical (i.e., low burden on clinician and patient) for practice.[3]

Brief review of background literature

Structure and Scoring of the OSPRO-YF tool

The OSPRO-YF tool[1] is one instrument for identifying pain-associated psychological distress in physical therapy practice. The instrument is divided into three domains, two of which assessing pain vulnerability (negative mood and fear avoidance) and one assessing pain resilience (positive affect and coping).[1] Within the latter domain are items evaluating pain self-efficacy and pain acceptance, and within the former are items evaluating depression, anxiety, anger, fear avoidance, pain catastrophizing, fear of movement, and pain-related anxiety.[1] An online scoring tool supported APTA Orthopedics provides both an estimate of how a respondent would score on a corresponding parent questionnaire for each construct as well as an indication about whether each score represents a yellow flag (**FIGURE 1**). A higher number of yellow flags on the OSPRO-YF tool is suggestive of a greater degree of pain-associated psychological distress, which may be the result of higher pain vulnerability, lower pain resilience, or a combination thereof.[7]

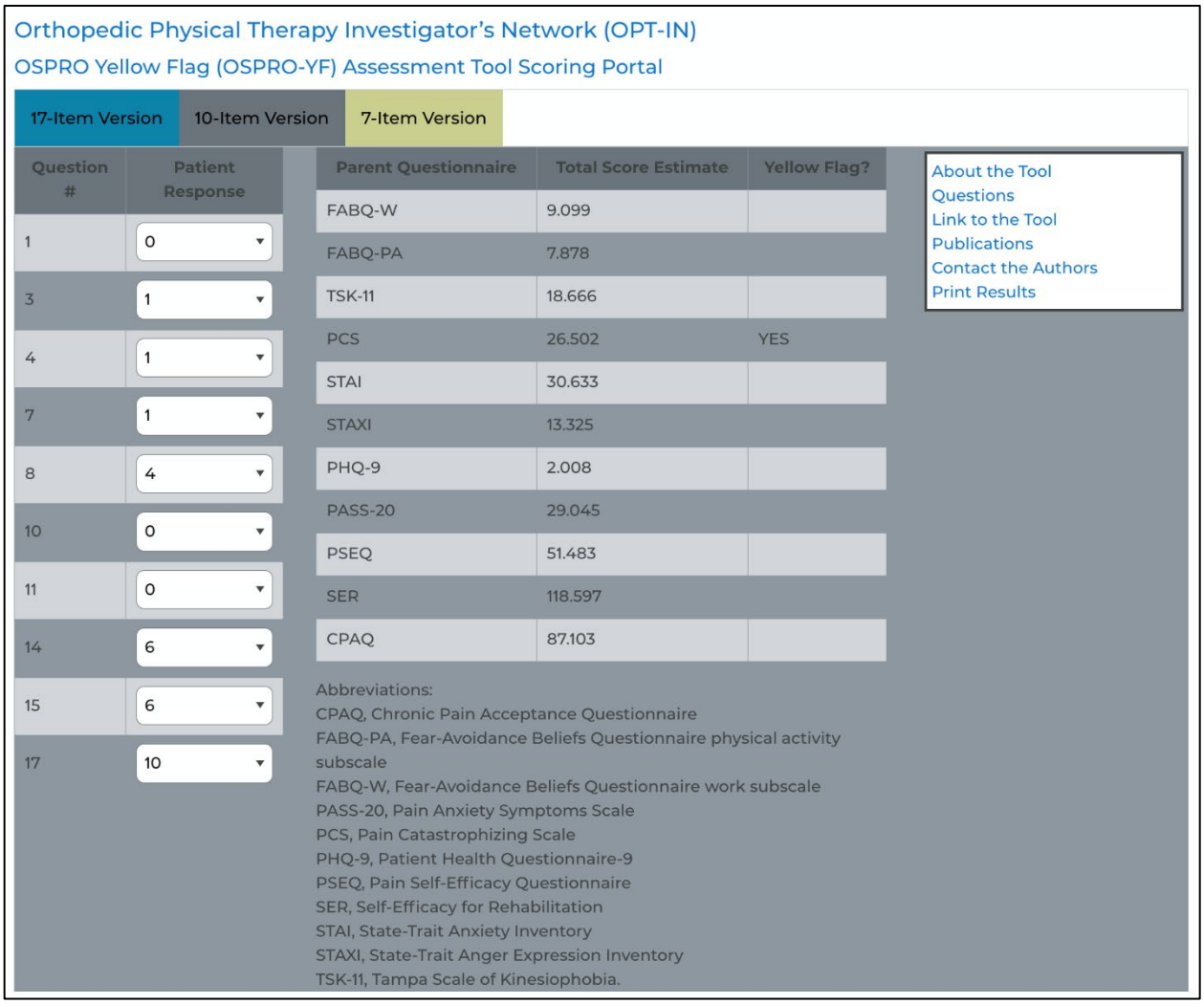

FIGURE 1. Hypothetical score output on the 10-Item Orthopedic Physical Therapy Investigator's Network (OPT-IN) OSPRO Yellow Flag (OSPRO-YF) Assessment Tool Scoring Portal.

Psychometric Properties of the OSPRO-YF tool

The OSPRO-YF tool is valid and reliable in individuals with neck,[1] low back,[1] shoulder,[1,28] and knee conditions.[1] Some research suggests the 10-item OSPRO-YF tool may perform better than the 17-item version.[2,5,7,29] This, combined with the theoretically lower patient burden of the shorter tool, may confer an advantage to the 10-item version over the 17-item version.

Applications: Prediction, Identification, Phenotyping, and Treatment Matching

Version notwithstanding, the OSPRO-YF tool can be a valuable asset for practicing clinicians, and an array of applications have been documented in the literature.[3-13] One application is in prediction – the OSPRO-YF may provide small but significant improvements in prediction of outcomes in the short,[4] medium,[4-6] and long-term.[5,7-9] A second application is in identification – because the OSPRO-YF is a multidimensional tool, it has the ability to identify multiple types of pain-associated psychological distress.[1] A third and more recent application derived from the literature is in phenotyping – evidence suggests that OSPRO-YF tool may assist in grouping patients into distress phenotypes, or clusters, based upon distinct presentations of pain-associated psychological distress.[10-13]

Implicit in the applications of identification and phenotyping is a fourth potential application – improved treatment matching. A clinician may better match treatment to risk profile, distress phenotype and/or underlying psychosocial pain mechanism.[14] For example, should the OSPRO-YF tool detect fear avoidant behavior in a patient presenting with knee pain, a clinician may decide that psychologically-informed physical therapy* without referral to another provider is the most appropriate overarching management strategy.[3] Other management strategies can also be matched to screening findings: patients without identifiable distress and with clear, prominent impairments of body structure and function may receive more traditional care that remains biopsychosocial in scope but places greater emphasis on biological factors than on psychosocial ones; patients with distress warranting additional specialized care (e.g., depressive symptoms) may receive a referral to a mental/behavioral health specialist alongside informed physical therapy care; and patients with distress that contraindicates physical therapy care (e.g., suicidal ideation) may receive immediate referral.[3] Accordingly, the type and involvement of intervention depend upon psychosocial profile. While management strategies may differ, their alignment with the patient's profile and suspected psychosocial mechanism(s) are consistent throughout.

---

*Psychological processes are inextricably linked to the experience of pain, and physical therapists should integrate knowledge of these processes into patient care as part of a comprehensive biopsychosocial approach. However, for the purposes of this review, *psychologically-informed physical therapy* is defined more narrowly as: care delivered with the primary intent of addressing maladaptive cognitive and behavioral processes when these are central to a patient's pain presentation. Psychologically-informed practice is not a single 'technique' but a multimodal approach that shifts the focus toward managing pain-related psychological distress and its contributing factors. In this sense, psychologically-informed physical therapy can be understood as consistent with – yet distinctively positioned within – the broader biopsychosocial model of pain management. The approach is also distinct from more traditional physical therapy care.

Patient Case

The following case is a hypothetical scenario used to illustrate use of the OSPRO-YF tool in clinical practice.

A 45-year-old female presented to a physical therapy clinic with right-sided low back pain of acute onset six weeks prior. At which time, the patient was bending forward to tie her shoe. On evaluation, the patient denied trauma or a prior history of symptoms. Imaging was suggestive of "age-related changes." The patient had not received treatment for her symptoms. The patient described her symptoms as "sharp" and "no one has ever felt pain like this… and I can't possibly take it." Her symptoms were localized to the right side of her lumbar spine, and she denied symptoms into the hip, buttock, or lower extremity. The patient reported her primary aggravating factor was forward bending, as required for tying her shoes, picking items up from the floor, and caring for her dog. The patient denied alleviating factors and notably reported, "There's nothing I can do to make my back feel better… I can't stop thinking about it." The patient's symptoms were reportedly worse in the morning or after heavy activity during the daytime.

As part of the clinic's standard intake process, the OSPRO-YF tool was administered electronically prior to the patient's initial evaluation. Guidelines recommend screening all patients at the initial point of care to increase the likelihood that patients with psychological distress are identified.[3] The patient's responses to the questionnaire were suggestive of pain-associated psychological distress and of one yellow flag in particular – pain catastrophizing.

Pain catastrophizing is an exaggerated negative mindset during experienced or anticipated pain[30] and is characterized by elements of rumination, magnification, and helplessness.[16] The patient's language during clinical history taking was consistent with elevated pain catastrophizing and well-illustrated by language like, "no one has ever felt pain like this [magnification]… and I can't possibly take it [helplessness]" and, "There's nothing I can do to make my back feel better [helplessness]… I can't stop thinking about it [rumination]." The physical therapist recognized such language as being indicative of pain catastrophizing, particularly in the context of significant findings from the OSPRO-YF. Patients with significant findings from the OSPRO-YF tool (i.e., yellow flags are identified) may be appropriate to complete a second unidimensional questionnaire that corresponds to the yellow flag dimension(s) identified on the OSPRO-YF tool.[3,16] The physical therapist subsequently administered the Pain Catastrophizing Scale (PCS)[15] to obtain greater detail about the patient's pain catastrophizing.

The Pain Catastrophizing scale is a questionnaire that measures catastrophizing across the three components of rumination, magnification, and helplessness, where a total score of 30 or higher represents a clinically relevant level of catastrophizing. The patient scored a 40 out of 52.[31] Findings from the patient's subjective examination, in addition to her responses to the two standardized questionnaires, provide strong evidence for a psychosocial mechanism as a key factor underlying her pain experience.

Pain catastrophizing may be an important mechanism and treatment target early in rehabilitation, in part because it is associated with higher pain intensity,[22] greater disability,[22] and absence from work[23] in acute low back pain. Pain catastrophizing is predictive of chronic low back pain.[18] Further, clinical guidelines recommend interventions for addressing psychological distress in low back pain.[32,33]

In the case of the above patient, pain-associated psychological distress was first identified using a standardized screening instrument and process. The physical therapist subsequently reviewed the results with the patient and chose to communicate what was observed, how it may be related to her pain, and the various options for treatment. The patient and physical therapist used shared decision-making to arrive at an overarching management strategy for the patient's pain, which was psychologically-informed physical therapy,[3] with targeted treatment toward catastrophic pain processing. The patient and physical therapist also agreed that, should the patient's symptoms persist or increase, referral to a mental health specialist could be beneficial. Signs of severe mental illness or suicidal ideation would have contraindicated physical therapy (at least until appropriately managed) and would have warranted immediate referral;[3] however, no such evidence was gathered. Therefore, care commenced and included cognitive behavioral, coping, and graded exposure strategies (among others) in addition to more traditional physical therapy interventions,[3] like thrust and nonthrust joint mobilization and exercise.[32]

As the patient progressed through her care, the physical therapist monitored not only pain intensity, lumbar range of motion, and disability, but also the patient's pain-associated psychological distress. Informally, the physical therapist monitored the frequency and strength of catastrophizing-consistent language and on a more formal basis, the physical therapist re-administered the OSPRO-YF and PCS tools. Re-administration first occurred after four weeks of care. In so doing, the physical therapist was able to compare new values to those obtained at baseline. Reassessment of pain-associated psychological distress is additionally outlined in the literature.[3,5,8]

Besides monitoring changes in distress, re-administration of a measure such as the OSPRO-YF provides an additional opportunity for risk assessment. Several studies have investigated the value of change scores on the OSPRO-YF in predicting long-term outcomes.[5,7-9] However, given the small additional value imparted by change scores in predicting long-term outcomes,[7,8] the OSPRO-YF may be better utilized to *refine* a baseline prediction.[8] In addition to the refinement of risk assessments, regular re-assessment using the OSPRO-YF tool can guide clinicians in choosing appropriate management strategies (which may include referral to other providers) as changes in pain-associated psychological distress occur. This regular re-assessment can, of course, occur from initial evaluation all the way through discharge.

Summary

"Yellow flags"[2] are markers of pain-associated psychological distress and often exemplified by maladaptive beliefs, appraisals, judgements, emotional responses, pain behaviors, and coping strategies.[17] An abundance literature recommends routine standardized screening for yellow flags and pain-associated psychological distress in physical therapy care.[3,11,17,24,25] The Optimal Screening for Prediction of Referral and Outcome (OSPRO) Yellow Flag (OSPRO-YF) tool[1] may aid in predicting outcomes,[4-9] identifying pain-associated psychological distress,[1] phenotyping,[10-13] treatment matching and mechanism-based treatment,[14] and assessing change.[3,5,7-9] The OSPRO-YF tool may accordingly serve as a useful instrument for clinicians to improve management of pain and disability in orthopedic physical therapy practice.

This Clinical Pearl was provided by Benjamin Davis, PT, DPT. Benjamin is a Senior II Physical Therapist at Shirley Ryan AbilityLab in Chicago, IL. He is a Board-Certified Clinical Specialist in Orthopaedic Physical Therapy and a Fellow of the American Academy of Orthopaedic

Manual Physical Therapists. Benjamin has a keen interest in incorporating contemporary pain science into clinical practice. Benjamin can be contacted by e-mail at bdavis04@sralab.org.

References

1. Lentz TA, Beneciuk JM, Bialosky JE, et al. Development of a Yellow Flag Assessment Tool for Orthopaedic Physical Therapists: Results From the Optimal Screening for Prediction of Referral and Outcome (OSPRO) Cohort. J Orthop Sports Phys Ther 2016;46(5):327-43. (In eng). DOI: 10.2519/jospt.2016.6487.
2. George SZ, Beneciuk JM, Lentz TA, Wu SS. The Optimal Screening for Prediction of Referral and Outcome (OSPRO) in patients with musculoskeletal pain conditions: a longitudinal validation cohort from the USA. BMJ Open 2017;7(6):e015188. (In eng). DOI: 10.1136/bmjopen-2016-015188.
3. Stearns ZR, Carvalho ML, Beneciuk JM, Lentz TA. Screening for Yellow Flags in Orthopaedic Physical Therapy: A Clinical Framework. J Orthop Sports Phys Ther 2021;51(9):459-469. (In eng). DOI: 10.2519/jospt.2021.10570.
4. Neeley DK, George SZ, Minick K, Snow G, Brennan G. Four Variables Were Sufficient for Low Back Pain: Determining Which Patient-Reported Tools Pain and Disability Improvements. J Orthop Sports Phys Ther 2022;52(10):685-693. (In eng). DOI: 10.2519/jospt.2022.11018.
5. Lentz TA, Beneciuk JM, George SZ. Prediction of healthcare utilization following an episode of physical therapy for musculoskeletal pain. BMC Health Serv Res 2018;18(1):648. (In eng). DOI: 10.1186/s12913-018-3470-6.
6. Morriss NJ, Kim BI, Poehlein E, et al. Association Between Preoperative Multidimensional Psychological Distress and Physical Function After Surgery for Sports-Related Injury. Orthop J Sports Med 2023;11(4):23259671231163854. (In eng). DOI: 10.1177/23259671231163854.
7. George SZ, Beneciuk JM, Lentz TA, et al. Optimal Screening for Prediction of Referral and Outcome (OSPRO) for Musculoskeletal Pain Conditions: Results From the Validation Cohort. J Orthop Sports Phys Ther 2018;48(6):460-475. (In eng). DOI: 10.2519/jospt.2018.7811.
8. George SZ, Li C, Luo S, Horn ME, Lentz TA. Longitudinal Monitoring of Pain Associated Distress With the Optimal Screening for Prediction of Referral and Outcome Yellow Flag Tool: Predicting Reduction in Pain Intensity and Disability. Arch Phys Med Rehabil 2020;101(10):1763-1770. (In eng). DOI: 10.1016/j.apmr.2020.05.025.
9. Horn ME, George SZ, Li C, Luo S, Lentz TA. Derivation of a Risk Assessment Tool for Prediction of Long-Term Pain Intensity Reduction After Physical Therapy. J Pain Res 2021;14:1515-1524. (In eng). DOI: 10.2147/jpr.S305973.
10. Levin JM, Baker R, Goltz DE, et al. Heterogeneity of pain-related psychological distress in patients seeking care for shoulder pathology. J Shoulder Elbow Surg 2022;31(4):681-687. (In eng). DOI: 10.1016/j.jse.2021.09.009.
11. Lentz TA, George SZ, Manickas-Hill O, et al. What General and Pain-associated Psychological Distress Phenotypes Exist Among Patients with Hip and Knee Osteoarthritis? Clin Orthop Relat Res 2020;478(12):2768-2783. (In eng). DOI: 10.1097/corr.0000000000001520.
12. Rhon DI, George SZ, Greenlee TA, Farrokhi S, Lentz TA. General and Pain-Associated Psychological Distress Phenotypes Among Patients With Low Back Pain in the Military Health System. Arthritis Care Res (Hoboken) 2024;76(7):943-952. (In eng). DOI: 10.1002/acr.25315.
13. Cabell GH, Kwon NF, Sutton KF, et al. Pain-Associated Psychological Distress Is of High Prevalence in Patients With Hip Pain: Characterizing Psychological Distress and Phenotypes. Arthrosc Sports Med Rehabil 2024;6(1):100846. (In eng). DOI: 10.1016/j.asmr.2023.100846.

14. Chimenti RL, Frey-Law LA, Sluka KA. A Mechanism-Based Approach to Physical Therapist Management of Pain. Phys Ther 2018;98(5):302-314. (In eng). DOI: 10.1093/ptj/pzy030.
15. Sullivan MJL, Bishop SR, Pivik J. The Pain Catastrophizing Scale: Development and validation. Psychological Assessment 1995;7(4):524-532. DOI: 10.1037/1040-3590.7.4.524.
16. Van Wyngaarden JJ, Noehren B, Archer KR. Assessing psychosocial profile in the physical therapy setting. Journal of Applied Biobehavioral Research 2019;24(2):e12165. DOI: https://doi.org/10.1111/jabr.12165.
17. Knoop J, Rutten G, Lever C, et al. Lack of Consensus Across Clinical Guidelines Regarding the Role of Psychosocial Factors Within Low Back Pain Care: A Systematic Review. J Pain 2021;22(12):1545-1559. (In eng). DOI: 10.1016/j.jpain.2021.04.013.
18. Mehling WE, Ebell MH, Avins AL, Hecht FM. Clinical decision rule for primary care patient with acute low back pain at risk of developing chronic pain. Spine J 2015;15(7):1577-86. (In eng). DOI: 10.1016/j.spinee.2015.03.003.
19. Meints SM, Edwards RR. Evaluating psychosocial contributions to chronic pain outcomes. Prog Neuropsychopharmacol Biol Psychiatry 2018;87(Pt B):168-182. (In eng). DOI: 10.1016/j.pnpbp.2018.01.017.
20. Jay K, Thorsen SV, Sundstrup E, et al. Fear Avoidance Beliefs and Risk of Long-Term Sickness Absence: Prospective Cohort Study among Workers with Musculoskeletal Pain. Pain Res Treat 2018;2018:8347120. (In eng). DOI: 10.1155/2018/8347120.
21. Løchting I, Garratt AM, Storheim K, Werner EL, Grotle M. The impact of psychological factors on condition-specific, generic and individualized patient reported outcomes in low back pain. Health Qual Life Outcomes 2017;15(1):40. (In eng). DOI: 10.1186/s12955-017-0593-0.
22. Ramírez-Maestre C, Esteve R, Ruiz-Párraga G, Gómez-Pérez L, López-Martínez AE. The Key Role of Pain Catastrophizing in the Disability of Patients with Acute Back Pain. Int J Behav Med 2017;24(2):239-248. (In eng). DOI: 10.1007/s12529-016-9600-9.
23. Macías-Toronjo I, Rojas-Ocaña MJ, Sánchez-Ramos JL, García-Navarro EB. Pain catastrophizing, kinesiophobia and fear-avoidance in non-specific work-related low-back pain as predictors of sickness absence. PLoS One 2020;15(12):e0242994. (In eng). DOI: 10.1371/journal.pone.0242994.
24. 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(1):e0227999. (In eng). DOI: 10.1371/journal.pone.0227999.
25. Wirth B, Schweinhardt P. Personalized assessment and management of non-specific low back pain. Eur J Pain 2024;28(2):181-198. (In eng). DOI: 10.1002/ejp.2190.
26. Delitto A, George SZ, Van Dillen L, et al. Low back pain. J Orthop Sports Phys Ther 2012;42(4):A1-57. (In eng). DOI: 10.2519/jospt.2012.42.4.A1.
27. Henning M, Smith M. The ability of physiotherapists to identify psychosocial factors in patients with musculoskeletal pain: A scoping review. Musculoskeletal Care 2023;21(2):502-515. (In eng). DOI: 10.1002/msc.1725.
28. Razmjou H, Palinkas V, Robarts S, Kennedy D. Psychometric Properties of the OSPRO-YF Screening Tool in Patients with Shoulder Pathology. Physiother Can 2021;73(1):26-36. (In eng). DOI: 10.3138/ptc-2019-0046.
29. Beneciuk JM, Lentz TA, He Y, Wu SS, George SZ. Prediction of Persistent Musculoskeletal Pain at 12 Months: A Secondary Analysis of the Optimal Screening for

Prediction of Referral and Outcome (OSPRO) Validation Cohort Study. Phys Ther 2018;98(5):290-301. (In eng). DOI: 10.1093/ptj/pzy021.
30. Sullivan MJL, Thorn B, Haythornthwaite JA, et al. Theoretical Perspectives on the Relation Between Catastrophizing and Pain. The Clinical Journal of Pain 2001;17(1):52-64. (https://journals.lww.com/clinicalpain/fulltext/2001/03000/theoretical_perspectives_on_the_relation_between.8.aspx).
31. Sullivan MJL. The Pain Catastrophizing Scale: User Manual. (https://aspecthealth.ca/wp-content/uploads/2017/03/PCSManual_English1.pdf).
32. George SZ, Fritz JM, Silfies SP, et al. Interventions for the Management of Acute and Chronic Low Back Pain: Revision 2021. J Orthop Sports Phys Ther 2021;51(11):Cpg1-cpg60. (In eng). DOI: 10.2519/jospt.2021.0304.
33. Corp N, Mansell G, Stynes S, et al. Evidence-based treatment recommendations for neck and low back pain across Europe: A systematic review of guidelines. Eur J Pain 2021;25(2):275-295. (In eng). DOI: 10.1002/ejp.1679.