Scandinavian Journal of Pain 17 (2017) 373–377

Contents lists available at ScienceDirect

Scandinavian Journal of Pain

journal homepage: www.ScandinavianJournalPain.com

Original experimental

Initial validation of the exercise chronic pain acceptance questionnaire

James D. Sessford*, Lawrence R. Brawley

College of Kinesiology, University of Saskatchewan, 87 Campus Drive, Saskatoon, SK S7N 5B2, Canada

HIGHLIGHTS

- An exercise-specific chronic pain acceptance questionnaire (CPAQ-E) is tested.
- The CPAQ-E demonstrated acceptable face validity, factor structure and reliability.
- The CPAQ-E predicted future bouts of planned exercise behaviour in this sample.

ARTICLE INFO

Article history:
Received 6 July 2017
Received in revised form
19 September 2017
Accepted 20 September 2017
Available online 18 October 2017

Keywords:
Pain acceptance
Exercise
Adherence
Arthritis
Chronic pain

ABSTRACT

Background and aims: Pain acceptance, measured by the chronic pain acceptance questionnaire (CPAQ), is related to exercise adherence for those with arthritis. The CPAQ measure has 20 items comprising two subscales – pain willingness and activities engagement about pursuing "valued daily activities" despite pain. However, exercise is not specified as a valued activity and respondents may be considering other activities raising generalizability and strength of prediction concerns.
Methods: Accordingly, a modified CPAQ solely for exercise (CPAQ-E) was developed to heighten salience to pursuit of exercise in the face of pain. An exercising sample with arthritis ($N = 98$) completed the CPAQ-E at baseline and exercise 2 weeks later. Exploratory factor analysis of the CPAQ-E was performed using Mplus. Regression was used to predict exercise.
Results: Analysis revealed a two-factor, 14 item model with good psychometric properties reflecting pain willingness and activities engagement subscales ($\chi^2 = 85.695$, df = 64, $p < .037$; RMSEA = .055; CFI = .967; TLI = .954). Both subscales and the total score positively predicted future weekly exercise bouts (range *ps* from < .05 to <.001). Activities engagement predicted future weekly exercise volume ($p < .05$).
Conclusions: This study offers preliminary support for the factorial and predictive validity of the CPAQ-E among exercising individuals with arthritis.
Implications: This measure could help researchers increase the specificity and sensitivity of pain acceptance responses to exercising among individuals with arthritis. A more sensitive measure might help clinicians interpret patient responses to exercise for pain self-management.

1. Introduction

Physical activity has been recommended as self-management for people with all types of arthritis (e.g., osteoarthritis, rheumatoid arthritis.) by both arthritis and public health advocates. They agree that those with arthritis of all types pursue the same goal of 150 min of moderate to vigorous physical activity (MVPA) to obtain multiple health benefits [1–3]. However, few people with arthritis meet this guideline [2]. Studies have identified *pain acceptance* as one potentially helpful psychological correlate in understanding adherence to MVPA [4,5].

What is pain acceptance? Pain acceptance describes a psychological factor that means some individuals acknowledge their pain, discard unproductive means of controlling pain, reject the notion of pain as equivalent to disability, and pursue their valued activities despite pain [6]. The chronic pain acceptance questionnaire (CPAQ) is a measure of pain acceptance [7] that has been developed and validated in chronic pain populations. However, the CPAQ is phrased generally and does not draw respondents' attention to specific valued activities (e.g., exercise) in answering the CPAQ items.

* Corresponding author.
E-mail addresses: james.sessford@usask.ca (J.D. Sessford), larry.brawley@usask.ca (L.R. Brawley).

http://dx.doi.org/10.1016/j.sjpain.2017.09.016
1877-8860/

To explore which activities people had in mind when answering the CPAQ, secondary analysis [8] of a larger arthritis exercise barriers investigation was conducted. Following completion of the CPAQ, exercising individuals with arthritis were offered examples of activities (e.g., employment, social, hobbies, household care, exercise, etc.) and they indicated whether each was considered when answering the CPAQ. On average, respondents considered 4 activities which they rated on a 0 (*Do not value at all*) to 10 (*Value very highly*) scale, with most of these personally selected activities being highly endorsed. Based on this analysis, these respondents to the original CPAQ concurrently considered many activities and were not exclusively focussed on exercise despite the fact that they were somewhat active and endorsed exercise as valued. Thus, when using the global CPAQ scores to correlate with exercise-specific variables, the correlation may not be a true reflection of the pain acceptance expressed if individuals were focussed on exercise alone.

The author of the original CPAQ was contacted [9] regarding a potential exercise modification and agreed it should be pursued, and did not foresee any reduction in validity if modifications were made. There is also precedent for successful CPAQ modification for other purposes and populations such as a short form [10] and a modification for adolescents [11].

1.1. Objectives and hypotheses

The present study had two related measurement objectives concerning factorial and predictive validity relative to the exercise-oriented version of the CPAQ, hereafter called the CPAQ-E. The first concerned examining the factorial validity of the CPAQ-E.

The second objective concerned the CPAQ-E's predictive utility and assessed whether the CPAQ-E or its subscales would predict future MVPA.

2. Methods

2.1. Participants and design

The study design was prospective, observational. Ninety-eight adults with self-reported, medically-diagnosed arthritis completed surveys at baseline and two weeks later. To participate, the following eligibility criteria were met: (a) 18 years of age or older, (b) residents of Canada or the United States, (c) report doing at least one bout of planned physical activity in the past 4 weeks lasting 15 min or more, (d) report having medically-diagnosed arthritis.

2.2. Measures

Pain acceptance for exercise. Pain acceptance was assessed using an exercise-oriented modification of the CPAQ [7] called the CPAQ-E. The original 20-item CPAQ is comprised of 2 subscales (pain willingness and activities engagement) and can also be interpreted as a total score. The CPAQ-E specified the wording of each original item to focus respondents' attention on exercise behaviour. A sample item from the pain willingness subscale is "I need to concentrate on getting rid of my pain before I can exercise" (originally "I need to concentrate on getting rid of my pain"). A sample from the activities engagement subscale is "I am getting on with my exercise plans no matter what my level of pain is" (originally "I am getting on with the business of living no matter what my level of pain is"). Participants rated each item in terms of how true it was for themselves on a 0 (*never true*) to 6 (*always true*) response scale. As with the original measure, CPAQ-E items in the pain willingness scale were reverse scored and summed while the activities engagement items were summed. The total CPAQ-E score was calculated by summing the 2 subscales. Higher scores on both subscales and for the total score represent higher pain acceptance, up to a maximum score of 114. The CPAQ has been validated in chronic pain populations [7] with good internal consistency and the CPAQ-E was internally consistent in the present study (Cronbach's $\alpha = .92$).

Physical activity. Participants reported the average weekly frequency and duration over the past two weeks of *planned bouts* of moderate and vigorous activity lasting at least 15 min. Total weekly planned PA volume was calculated in a manner consistent with public health recommendations and previous work on PA and arthritis [2,12,13]. Definitions of moderate and vigorous activity were provided to participants. Moderate activity was defined as "*. . . makes your heart beat faster and makes you breathe a little harder. You can talk easily while doing moderate activity, but you may not be able to sing comfortably. On a scale from 0 to 10, where sitting is 0 and the highest level of effort possible is 10, moderate exercise is a 5 or 6.* Vigorous activity was defined as "*. . . makes your heart beat much faster. You may not be able to talk comfortably without stopping to catch your breath. On a scale of 0 to 10, where sitting is 0 and the highest level of effort possible is 10, vigorous activity is a 7 or 8.*"

Activity bouts of less than 15 min were not assessed because the present study focused on *planned activity* that required self-regulation. This is in contrast to unplanned, shorter incidental bouts. Planned bouts of longer duration have also demonstrated better recall and are self-reported with higher accuracy than unplanned, incidental short duration bouts of activity [14]. In the present study, pain-related beliefs about *planned MVPA* was used to predict the correspondent planned MVPA bout frequency and minutes (i.e., volume). What is being self-regulated is the time individuals take to complete a given bout of either moderate and/or vigorous activity in excess of 15 continuous minutes. Therefore, the total volume of planned PA per week was calculated with a focus on minutes of either kind of activity as defined in the measure's instructions. Accordingly, weekly moderate activity (frequency × duration) and weekly vigorous activity (frequency × duration) were summed for total volume. Frequency represented the number of planned weekly bouts of MVPA and this was used as an additional behavioural indicant of exercise.

2.3. Procedures

Upon obtaining approval from the University Behavioural Research Ethics Board, web-based study announcements were used to recruit the study sample. These announcements included a link to the online survey and were posted to arthritis newsletters and to national arthritis organisations' official websites (e.g., the Arthritis Society, local chronic disease programme, etc.). Announcements were also posted to social media pages of these organizations (e.g., Facebook, Twitter).

At the onset of the online survey, participants were required to complete the electronic consent form. After answering questions pertaining to eligibility criteria, participants completed the 20–30 min survey, which included the CPAQ-E. A link to the brief follow-up survey consisting of the exercise measure was sent by email two weeks later to those participants who provided their permission.

2.4. Data management and analytical plan

Analyses were performed using SPSS version 23 and Mplus. Data were screened for outliers and for missing data. Mean item score replacement for a given individual was used for an individual's scales that were missing a single item [15]. A small number of participants reported either the days or minutes of exercise ($n = 2$) and one was missing both. A conservative strategy was utilized for replacing the missing MVPA data whereby the lowest possible answer was inserted (i.e., 1 day, or 15 min – if minutes were

Table 1
CPAQ-E factor models.

# of items	# of factors	Fit indices						
		Chi-square analyses			RMSEA analysis		CFI	TLI
		χ^2	*df*	*p*	RMSEA	90% CI		
19	1	400.648	152	<.001	.121	.107–.136	.733	.700
	2	296.886	134	<.001	.105	.089–.121	.825	.777
14	1	182.474	77	<.001	.111	.090–.132	.841	.812
	2	**85.695**	**64**	**.037**	**.055**	**.015–.084**	**.967**	**.954**

Note: RMSEA: root mean square error of approximation; CFI: comparative fit index; TLI: Tucker–Lewis index. Models examined reflect the 19- and 14-item versions of the CPAQ-E. Boldface coefficients display the fit indices of the 14-item, two-factor retained model.

reported, they must have been performed on at least 1 day). For inclusion, activity bouts needed to be 15 min or more.

Z-scores greater than 3.29 indicated outliers and were only found in the weekly MVPA volume scores. These outliers were handled according to recommendations by Tabachnick and Fidell [15] such that the lowest score among the outliers was reduced to 1 score (1 min) greater than the next largest MVPA score. This procedure addresses the problem of an outlier while maintaining rank order of individual values.

To examine the objective regarding factorial validity, an exploratory factor analysis (EFA) was conducted on the CPAQ-E measure using Mplus 7.31 [16], using Mplus's robust maximum likelihood estimator (MLR) with a geomin rotation. MLR estimation is robust to violations of normality [16]. Mplus factor analysis was performed using an iterative procedure. Advantages of using Mplus rather than SPSS for factor analysis include use of a gold standard method (maximum likelihood) for estimating missing data and provision of significance tests for factor loadings [16]. Assumptions of the analysis were tested and met including sampling adequacy and controlling outliers. The original CPAQ consists of 2 correlated subscales. Thus, an oblique rotation was used.

A second study objective concerned predictive validity of the CPAQ-E. Predictions were examined using simple linear regressions. Assumptions of regression were tested and met including multicollinearity and homoscedasicity. Separate regressions were conducted using each of the potential predictors (CPAQ-E total score and each of the 2 subscales) as the independent variable and MVPA as the dependent variable (both MVPA volume and MVPA bouts were analyzed as the dependent variable in separate analyses).

3. Results

One-hundred ninety participants began the Time 1 survey. Participant exclusion and attrition was as follows: 29 participants were excluded for eligibility reasons, 25 failed to complete the second survey, and 38 began survey 1 but did not complete it. The majority of the final sample ($N = 98$, $M_{age} = 49.66 \pm 14.23$ years) was white (91.8%), female (86%), and completed some form of post-secondary education (89.8%). Just over half (51%) were married. The number of years since arthritis diagnosis varied from less than a year (7.1%), 1–5 years (22.4%), 6–10 years (21.4%), 11–15 years (20.4%), 16–20 years (6.1%), to over 20 years (22.4%). The sample reported using medication to control their arthritis (84.7%). The most commonly reported co-morbidities included depression (20.4%), high blood pressure (17.3%), thyroid (16.3%), while 27.6% reported no co-morbidities.

3.1. Pain acceptance factor structure

Item 9 from the 20-item original CPAQ measure was excluded due to an error during building the online survey. When analyzed using Mplus, the initial 19-item CPAQ-E model had poor fit when the expected 2-factor solution that constitutes the original CPAQ was examined (e.g., significant χ^2, RMSEA > 0.10). Consequently, an iterative procedure was then undertaken whereby items were omitted one at a time to assess the effect of their removal on the model. This approach resulted in the removal of items 2, 4, 5, 10, and 16. The reasons for item removal were as follows. Item 2 was multi-collinear with item 6 as indicated by modification indices ($\theta = 36.88$) and a correlation of .72. Items 4, 5, 10, and 16 did not load significantly on either factor.

The reduced 14-item scale resulted in a 2-factor model with good fit indices as can be seen in Table 1 (RMSEA = .055, CFI = .97). As illustrated by Table 2, all CPAQ-E items in the reduced model loaded on the expected subscale consistent with the original CPAQ conceptualization. Regarding psychometrics, both subscales were internally consistent (Cronbach's $\alpha = .88$). Descriptive statistics and correlations between CPAQ-E subscales can be found in Table 3.

3.2. Predicting physical activity volume

Weekly volume. Using the various independent variables as single predictors, the results were as follows. The CPAQ-E activities engagement subscale significantly predicted weekly minutes

Table 2
Factor loadings for the final 14-item model of CPAQ-E.

Item description	Factor one	Factor two
1. I am getting on with my exercise plans no matter what my level of pain is.[a]	**.90**	−.06
3. It's OK to experience pain during exercise.[a]	**.34**	.17
6. Although things have changed, I am able to exercise despite my chronic pain.[a]	**.43**	.26
7. I need to concentrate on getting rid of my pain before I can exercise.[b]	.08	**.67**
8. There are many activities I do when I feel pain, such as exercise.[a]	**.76**	−.01
11. My thoughts and feelings about pain must change before I can exercise.[b]	−.02	**.72**
12. Despite the pain, I am now sticking to my exercise plans.[a]	**.84**	.04
13. Keeping my pain level under control takes first priority, above exercising.[b]	.21	**.69**
14. Before I can make any serious exercise plans, I have to get some control over my pain.[b]	.19	**.72**
15. When my pain increases, I can still exercise.[a]	**.68**	.19
17. I avoid putting myself in exercise situations where my pain might increase.[b]	−.23	**.87**
18. My worries and fears about what exercise-related pain will do to me are true.[b]	.03	**.78**
19. It's a relief to realize that I don't have to change my pain to get on with my exercise plans.[a]	**.55**	.14
20. I have to struggle to do exercise when I have pain.[b]	−.04	**.55**

Note: Boldfaced coefficients represent loadings retained for each factor. Excluded items were as follows: Item 2. My exercise is going well, even though I have chronic pain.; Item 4. I would gladly sacrifice exercise to control this pain better.; Item 5. It's not necessary for me to control my pain in order to exercise.; Item 10. Controlling pain is less important than exercise.; Item 16. I will have better control over my exercise plans if I can control my negative thoughts about pain.

[a] Activities engagement subscale.
[b] Pain willingness subscale.

Table 3
Correlations and descriptives for CPAQ-E.

Measure	$M \pm SD$	1.	2.	3.
1. Activities engagement	36.9 ± 10.2	–	.683**	.918**
2. Pain willingness	29.7 ± 10.1	–	–	.916**
3. CPAQ-E total	66.5 ± 18.6	–	–	–

** $p < .01$.

of planned MVPA ($R^2Adj. = .05$, $p = .014$) but in separate analyses, each of the total score and the pain willingness subscale did not.

Weekly bouts. Each of the independent variables was used to predict bouts of planned activity. The CPAQ-E activities engagement subscale significantly predicted weekly bouts of MVPA ($R^2Adj. = .126$, $p < .001$) as did the total score ($R^2Adj. = .084$, $p = .002$) and the pain willingness subscale ($R^2Adj. = .033$, $p < .05$).

4. Discussion

The CPAQ represents people's willingness to pursue valued daily activities despite pain. The CPAQ has demonstrated utility in exercise studies such that higher scores correspond with higher levels of PA volume [4,5]. However, an obvious critique of the use of the original measure for exercise studies is that people may be thinking of a variety of "valued activities" (e.g., employment, family care, etc.) and not just exercise when answering the CPAQ items [8]. This response would represent more global pain acceptance rather than a response salient to engaging in exercise regardless of pain. An exercise-specific modification to the CPAQ may be more appropriate for use in exercise studies [9]. The present study sought to assess the exercise-specific CPAQ-E in terms of factorial validity, reliability, and predictive validity. Findings support initial evidence of the factorial and predictive validity of the CPAQ-E. Specifically, the final 14 item two-factor CPAQ-E is conceptually consistent with the original 20 item measure's (CPAQ) operationalization as a two-factor construct. CPAQ-E items loaded on the same subscales as on the original CPAQ (activities engagement and pain willingness) and have acceptable reliability scores.

Regarding predictive validity, the activities engagement subscale is the only score on the CPAQ-E that predicted *weekly minutes* of activity. However, the total score and both CPAQ-E subscales significantly predicted *weekly bouts* of activity. One possible explanation for these results is that recall for number of bouts is better than for total weekly minutes suggesting that the measurement error associated with recall of minutes may be partly the reason for differences in predictive utility. Depending on the pain acceptance research question of interest in future studies, it is important to be aware of the correspondence between CPAQ-E predictor variables and the nature of the dependent measures of interest. Arbitrary selection of predictors and outcomes and how they are measured (e.g., non-correspondence between a specific CPAQ-E subscale and a general outcome such as calories burned in exercise) could inflate measurement error or constrain variability in both measures thereby leading to reduced predictive utility.

4.1. Strengths and limitations

This study provides initial evidence that may improve decision-making regarding choice of pain acceptance measures in studies of exercise and arthritis. It is the first test of an exercise-specific modification of the CPAQ. The strength of this study is that it is a first step towards testing a pain acceptance measure which focuses respondents on exercise behaviour and away from various other valued activities. General measures used without taking context and salience into account might not have the validity necessary to answer questions about pain acceptance and exercise among individuals with arthritis. For example, correspondence between predictive measures and the behaviour of interest has been highlighted as important in self-efficacy measurement among individuals with chronic disease [17,18]. Salience to respondents with pain is also considered to be important for other predictors of exercise behaviour such as self-efficacy [18] and in psychological problem solving research, the importance of correspondence between salient methodology (i.e., measurement) and specific samples is highlighted, thus focussing respondents on the target behaviour [19]. Using that idea in the present study, the same care and intent was taken by modifying the CPAQ to enhance correspondence between the CPAQ-E and frequency of exercise.

Given this investigation is an initial study of the CPAQ-E, it is important to be mindful of its limitations. The first is related to generalizability given the predominantly female sample and the fact that recruitment efforts yielded a select sample who access arthritis groups. This limits the generalizability about males with arthritis and those not accessing arthritis groups via their websites and social media. However, females tend to be the predominant part of the samples in other studies of exercise and arthritis [20]. Thus, the proportion of the genders who volunteered for the present study is similar to that reported in other published exercise and arthritis research.

A second limitation may be the use of a self-report exercise measure as opposed to objective measures (e.g., accelerometry). However, there are also limitations of the use of accelerometry in chronic pain populations, including those with chronic disease or physical impairment. For example, a recent study by Rejeski and colleagues [21] of older adults in the LIFE intervention found extreme variability in median accelerometry counts per minute achieved during a controlled bout of exercise. Further, they noted that objectively defining MVPA intensity for exercise prescription using set cutpoints for older adults with different disabilities may be inconsistent with their performance capability and may be inadvisable to use for setting goals, examining adherence, or considering change. The reality of using perceptual cues to guide exercise counselling is advised.

This advice pairs well with importance of participants' estimates of the willingness to accept pain in order to exercise. For example, for adults with peripheral artery disease who experience pain in their lower extremities, objectively assessed moderate activity prescription will not only be influenced by pain symptoms in their lower extremities but also by their perceived willingness to accept this pain in order to pursue their prescription [22]. Thus, an objectively assessed generic activity prescription may not match well with perceptions guiding actual capability.

A third and final limitation is that the original CPAQ measure was not included in this study. This was a conscious decision to reduce subject burden, realizing it constrained the ability to directly compare responses between the CPAQ and CPAQ-E for the same subject. Whereas the CPAQ-E is similar to the original, it also differs with respect to (a) its references t exercise in each item to increase salience and focus participants exclusively on exercise and (b) having five fewer items.

The CPAQ-E had over one quarter of its items removed through the exploratory factor analytic process. This finding speaks to the possibility that in other exercise studies, including our own, use of the original CPAQ and its more global pain acceptance response for a variety of activities (i.e., vs exercise alone), may have reduced the sensitivity of the measure with respect to an exclusively exercise response. Given the differences between the two pain acceptance measures, direct comparisons may not be possible but comparison through identification of the strength of pain acceptance or the predictive utility of the measures seems more likely.

There is precedent in the literature for other CPAQ modifications not being compared to the original measure. For example, initial

study of another CPAQ modification, the CPAQ-A for adolescents [11], was made without a direct comparison to the original CPAQ.

Regardless, a future comparison of the utility of the CPAQ and the CPAQ-E in predicting PA would be of value. It may be prudent to compare each measure using separate randomly-selected subgroups within the same large sample (i.e., exercisers with chronic pain) to determine if there are differences in CPAQ and CPAQ-E responses between subgroups of the larger homogeneous sample.

As well, future studies should examine test-retest reliability relative to the stability of the CPAQ-E scores across multiple measurement time points. Finally, and relative to factorial validity, gathering data from additional samples should be a future research goal in order to examine its factor structure via confirmatory factor analysis [23].

5. Conclusions

The present study offers preliminary support for the utility of the CPAQ-E in studies of exercise and arthritis. Further examination of the CPAQ-E's utility in predicting exercise behaviour or differentiating among exercising individuals and the inactive in the broader chronic pain population is also suggested.

Funding

Canada Research Chairs Programme Training Funds.

Ethical issues

Ethics board approval was obtained, informed consent was obtained, and study protocol was not registered.

Conflicts of interest

None declared.

References

[1] Arthritis Society. The Arthritis Society's five-year strategic research plan, 2011–16. https://arthritis.ca/page.aspx?pid=1172 [accessed 17.09.15].
[2] Public Health Agency of Canada Centre for Chronic Disease Prevention and Control, & Chronic Disease Surveillance Division. Life with arthritis in Canada: a personal and public health challenge; 2015. http://www.phac-aspc.gc.ca/cd-mc/arthritis-arthrite/lwaic-vaaac-10/pdf/arthritis-2010-eng.pdf [accessed 17.09.15].
[3] Alliance for the Canadian Arthritis Program. Report from the summit on standards for arthritis prevention and care. http://www.arthritisalliance.ca/images/PressReleases/ACAP%20Release%20English%20FINAL.pdf [accessed 17.09.15].
[4] Gyurcsik NC, Brawley LR, Spink KS, Glazebrook KE, Anderson TJ. Is level of pain acceptance differentially related to social cognitions and behavior? The case of active women with arthritis. J Health Psychol 2011;16:530–9, http://dx.doi.org/10.1177/1359105310394229.
[5] Flora PK, Brawley LR, Sessford JD, Cary MA, Gyurcsik NC. Predicting planned physical activity of individuals with arthritis: a self-regulatory perspective. J Health Psychol 2015, doi:1359105315583370 [pii].
[6] McCracken LM. Learning to live with the pain: acceptance of pain predicts adjustment in persons with chronic pain. Pain 1998;74:21–7. S0304-3959(97)00146-2.
[7] McCracken LM, Vowles KE, Eccleston C. Acceptance of chronic pain: component analysis and a revised assessment method. Pain 2004;107:159–66, pii:S0304395903004299.
[8] Sessford JD (Ph.D.) Do coping strategies for pain mediate between psychosocial factors and physical activity for people with chronic pain? University of Saskatchewan; 2017.
[9] McCracken LM. Personal communication. 2014.
[10] Rovner GS, Arestedt K, Gerdle B, Borsbo B, McCracken LM. Psychometric properties of the 8-item Chronic Pain Acceptance Questionnaire (CPAQ-8) in a Swedish chronic pain cohort. J Rehabil Med 2014;46:73–80, http://dx.doi.org/10.2340/16501977-1227.
[11] McCracken LM, Gauntlett-Gilbert J, Eccleston C. Acceptance of pain in adolescents with chronic pain: validation of an adapted assessment instrument and preliminary correlation analyses. Eur J Pain 2010;14:316–20, http://dx.doi.org/10.1016/j.ejpain.2009.05.002.
[12] Centers for Disease Control and Prevention. Physical activity and arthritis overview. http://www.cdc.gov/arthritis/pa_overview.htm#3 [accessed 17.09.15].
[13] Gyurcsik NC, Brawley LR, Spink KS, Sessford JD. Meeting physical activity recommendations: self-regulatory efficacy characterizes differential adherence during arthritis flares. Rehabil Psychol 2013;58:43–50, http://dx.doi.org/10.1037/a0031293.
[14] Cust AE, Smith BJ, Chau J, van der Ploeg HP, Friedenreich CM, Armstrong BK, Bauman A. Validity and repeatability of the EPIC physical activity questionnaire: a validation study using accelerometers as an objective measure. Int J Behav Nutr Phys Act 2008;5, http://dx.doi.org/10.1186/1479-5868-5-33.
[15] Tabachnick BG, Fidell LS. Using multivariate statistics. Boston, MA: Pearson/Allyn & Bacon; 2012.
[16] Muthen LK, Muthen BO. Mplus user's guide. 7th ed. Los Angeles, CA: Muthén & Muthén; 1998–2012.
[17] Frei A, Svarin A, Steurer-Stey C, Puhan MA. Self-efficacy instruments for patients with chronic diseases suffer from methodological limitations – a systematic review. Health Qual Life Outcomes 2009;7, http://dx.doi.org/10.1186/1477-7525-7-86.
[18] Marks R. Self-efficacy and its application in the treatment of knee osteoarthritis: a critical review. Rheumatol Rep 2012;4:34–45, http://dx.doi.org/10.4081/rr.2012.e10.
[19] Elliott TR, Grant JS, Miller DM. Social problem-solving abilities and behavioral health. In: Chang EC, D'Zurilla TJ, Sanna L, editors. Social problem solving: theory, research, and training. Washington, DC: American Psychological Association; 2004. p. 117–33.
[20] Gyurcsik NC, Cary MA, Sessford JD, Flora PK, Brawley LR. Pain, anxiety, and negative outcome expectations for activity: do negative psychological profiles differ between the inactive and active? Arthritis Care Res (Hoboken) 2015;67:58–64, http://dx.doi.org/10.1002/acr.22421.
[21] Rejeski WJ, Marsh AP, Brubaker PH, Buman M, Fielding RA, Hire D, Manini T, Rego A, Miller ME, Study LIFE, Investigators. Analysis and interpretation of accelerometry data in older adults: the LIFE study. J Gerontol A Biol Sci Med Sci 2016;71:521–8, http://dx.doi.org/10.1093/gerona/glv204.
[22] Rejeski WJ, Tian L, Liao Y, McDermott MM. Social cognitive constructs and the promotion of physical activity in patients with peripheral artery disease. J Cardiopulm Rehabil Prev 2008;28:65–72, http://dx.doi.org/10.1097/01.HCR.0000311512.61967.6e.
[23] Cudeck, R, MacCallum, RC, eds. Factor analysis at 100: historical developments and future directions. Routledge; 2007.