Patient Related Outcome Measures

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SHORT REPORT

Measurement properties of the Fear-Avoidance Belief Questionnaire for physical activity in patients with shoulder impingement syndrome

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Background: The Fear-Avoidance Belief Questionnaire for physical activity (FABQ-PA) was originally developed for patients with low-back pain. Whether the FABQ-PA is suitable for use among patients with other musculoskeletal disorders has been sparsely evaluated.

Purpose: To evaluate test–retest reliability, measurement error, construct validity, and responsiveness of the FABQ-PA in patients with shoulder impingement syndrome (SIS).

Methods: This prospective cohort study included 45 patients with SIS. Data were collected with questionnaires at baseline, after 2–4 days, and at 3 months, which included the Danish versions of the FABQ-PA and the Oxford Shoulder Score (OSS). Test–retest reliability was assessed by intraclass correlation, and standard error of measurement was estimated and converted into the minimal detectable change (MDC). Construct validity was investigated by analyzing the correlation between the baseline scores of the FABQ-PA and the OSS. Responsiveness was investigated from longitudinal construct validity using a correlation analysis reflecting changes over time.

Results: Test–retest reliability showed an intraclass correlation of 0.80, and examination of the measurement error showed no systematic differences and a MDC of 7.95 (95% CI 6.57–10.07). Construct validity showed a correlation of –0.60 (95% CI –0.76 to –0.37) between the FABQ-PA and OSS at baseline. A weaker correlation between FABQ-PA- and OSS-change scores was observed (–0.43, 95% CI –0.67 to –0.12).

Conclusion: The Danish version of the FABQ-PA is suitable for assessing fear-avoidance beliefs in groups of patients with SIS, but its ability to evaluate individual patients and changes over time may be more limited.

Keywords: outcome measures, validity, reliability, measurement error, responsiveness

Background

Shoulder impingement syndrome (SIS) is one of the most common causes of shoulder pain.[1,2] SIS is often a recurrent problem, with a low recovery rate.[3] This indicates that SIS can lead to chronic pain, which can affect the patient both physically and mentally. The fear-avoidance model of exaggerated pain perception describes how pain-related fear can impact outcomes. The model argues that avoiding physical activity due to fear of pain (fear-avoidance behavior) can have negative consequences for patients with musculoskeletal pain by contributing to chronic pain development.[4] One of the most commonly used questionnaires to asses fear avoidance in patients with musculoskeletal pain is the Fear-Avoidance Belief Questionnaire (FABQ) developed by Waddell et al.[5] The FABQ screening tool was originally developed for patients with low-back pain (LBP). The subscale for physical activity (Fear-Avoidance Belief Questionnaire for physical activity

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[FABQ-PA]) has been shown to be a reliable and valid measure of fear-avoidance behavior in patients with LBP.[6] A recent study argued that the FABQ is the most suitable measure also for assessing fear-avoidance behavior in patients with shoulder pain.[7] The study showed high test–retest reliability of the FABQ-PA, but several important aspects of the measurement properties, such as measurement error and responsiveness, were not established.[8] Furthermore, measurement properties may vary across countries, and should thus be evaluated in the population in which they are going to be utilized.[8] The FABQ-PA has been translated and cross-culturally adapted to the Danish population among patients with LBP,[9] but its measurement properties have not been evaluated in SIS patients. The aim of the present study was thus to evaluate reliability, measurement error, construct validity, and responsiveness of the Danish version of the FABQ-PA.

Methods

Design and population

Subjects included in this prospective cohort study were patients with SIS recruited from rehabilitation units, physical therapy clinics, and one hospital in the Central Denmark Region.[10] We included patients who were aged 18 years or more and diagnosed with SIS by a medical doctor or physical therapist. Exclusion criteria included other shoulder pathologies, any surgical treatment in the affected shoulder during the past 12 months, mental disorders, or insufficient Danish-language skills to communicate and complete the questionnaires.

Procedure

Patients were recruited in between October 31 and December 15, 2011. Patients completed questionnaires at three time points: baseline (T0), 2–4 days after baseline (T1), and at 3 months (T2). The questionnaire included the FABQ-PA and the Oxford Shoulder Score (OSS). The FABQ-PA contains five items, of which four are added to a sum score of 0–24, with 0 being the best outcome. The OSS questionnaire has been developed to assess patients with degenerative or post-traumatic shoulder diseases.[11] It contains 12 items related to pain and functional ability, and the sum score ranges from 0 to 48, with 48 being the best outcome. The OSS has shown acceptable validity and reliability[11] and a good level of responsiveness.[12]

Statistical analysis

A minimum sample size of 50 subjects was recommended in a method-comparison study for sufficient precision.[8] Descriptive statistics were calculated for all variables. Test–retest reliability was investigated using an intraclass correlation coefficient (ICC) with 95% CI calculated in long format 2.1. The test–retest interval was between T0 and T1. Paired *t*-tests were used to assess systematic differences between T0 and T1 scores on the FABQ-PA. Measurement error was assessed by test–retest and is presented as 95% limits of agreement. Bland–Altman plots were made by plotting differences between the two measurements against the mean of the two sum scores, showing 95% limits of agreement and 95% CI. Minimal detectable change (MDC) was estimated by first calculating the standard error of measurement (SEM) between the T0 score and the T1 score ($SEM = SD/\sqrt{2}$). SEM was then converted into MDC ($MDC = 1.96 \times \sqrt{2} \times SEM$).[8] Construct validity was evaluated by correlation analysis (Pearson) of T0 scores of the FABQ-PA and the OSS. Last responsiveness was assessed as longitudinal construct validity by calculating Pearson's correlation coefficient of change scores from T0 to T2 of the FABQ-PA with the OSS.[8] We hypothesized an acceptable test–retest reliability corresponding to an ICC >0.70 based on applicable standards.[8] Correlation coefficients of FABQ-PA and OSS scores were interpreted as weak ($r<0.3$) to moderate ($r>0.3$ and<0.6) correlations. For statistical analysis, Stata version 15 software was used.

Results

Descriptive statistics

A total of 74 patients were assessed for eligibility, of whom 9 were excluded, 3 did not show up, 2 withdrew, 2 became ill, and 13 declined participation.[10] The final study population thus included 45 patients. Baseline characteristics of the included patients are presented in Table 1. One patient failed to complete the FABQ-PA questionnaire at T0 and T1 and was excluded from analysis. A total of 37 patients completed the follow-up questionnaire at 3 months.

Measurement properties

Test–retest reliability displayed an ICC of 0.80 (95% CI 0.70–0.91). No statistically significant systematic differences were found between T0 and T1 on the FABQ-PA (–0.14, 95% CI –1.37 to 1.10), 95% limits of agreement were estimated to be –8.07 to 7.81 (Figure 1), and the MDC was 7.95 (95% CI 6.57–10.07). Assessment of construct validity at T0 between the FABQ-PA and OSS showed $r=$ –0.60 (95% CI –0.76 to –0.37) (Figure 2A). Absolute mean changes from T0 to T2 for the FABQ-PA were –1.86 (95% CI –4.05 to 0.33) and 4.57 (95% CI 2.59, 6.54) for the OSS.

Table 1 Patient characteristics at baseline (n=45)

	Value[a]
Sex (male)	27 (60.0)
Age (years), mean ± SD	48.1±15.0
BMI, mean ± SD	27.1±5.5
Pain duration	
<7 months	11 (24.4)
7–12 months	14 (31.1)
13–24 months	6 (13.3)
>24 months	14 (31.1)
Employment	
Currently employed	28 (62.2)
Unemployed	5 (11.1)
Student/training	3 (6.7)
Retired	9 (20.0)
On sick leave	8 (17.8)
Baseline score, mean ± SD	
FABQ-PA (0–24), n=44	12.8±6.5
OSS (0–48), n=45	32.1±8.2

Note: [a]Values are n (%) unless otherwise indicated.
Abbreviations: BMI, body-mass index; FABQ-PA, Fear-Avoidance Belief Questionnaire for physical activity; OSS, Oxford Shoulder Score.

Change scores from T0 to T2 for the FABQ-PA and the OSS (Figure 2B) displayed $r = -0.43$ (95% CI –0.67 to –0.12).

Discussion

Measurement properties for the Danish version of the FABQ-PA were established in patients with SIS. Test–retest reliability was found to be acceptable, and construct validity was confirmed by a moderate correlation with the OSS. In patient-reported outcomes, it is generally recommended that reliability coefficients at least exceed 0.70 to distinguish between groups in clinical trials and 0.90 to assess individual patients.[13] According to these recommendations, the FABQ-PA may be most suitable for evaluation at group level. The estimated MDC indicates that a minimum of 8 points are needed to detect a "true" within-person change in the total score of 24 points. Although construct validity was confirmed by a moderate level of correlation between the FABQ-PA and OSS at baseline, the weaker correlation observed for change scores may suggest the longitudinal construct validity (responsiveness) to be more limited. The results of the present study are in line with those of a previous study,[6] which reported an ICC of 0.88 (95% CI 0.75–0.93) for the FABQ-PA in patients with shoulder pain. To our knowledge, the present study is the first to evaluate measurement error and responsiveness of the FABQ in patients with shoulder pain. The construct validity and measurement error of the FABQ-PA have previously been evaluated in Norwegian patients with LBP, where a moderate correlation with disability and an MDC of 8.95 points were found.[6] Equivalent findings were obtained in the present study. Grotle et al found a moderate level of responsiveness for the FABQ-PA. Our results may suggest a weaker level of responsiveness for the FABQ-PA in patients with SIS, corresponding to what has previously been reported for patients with LBP.[14] Limitations of the

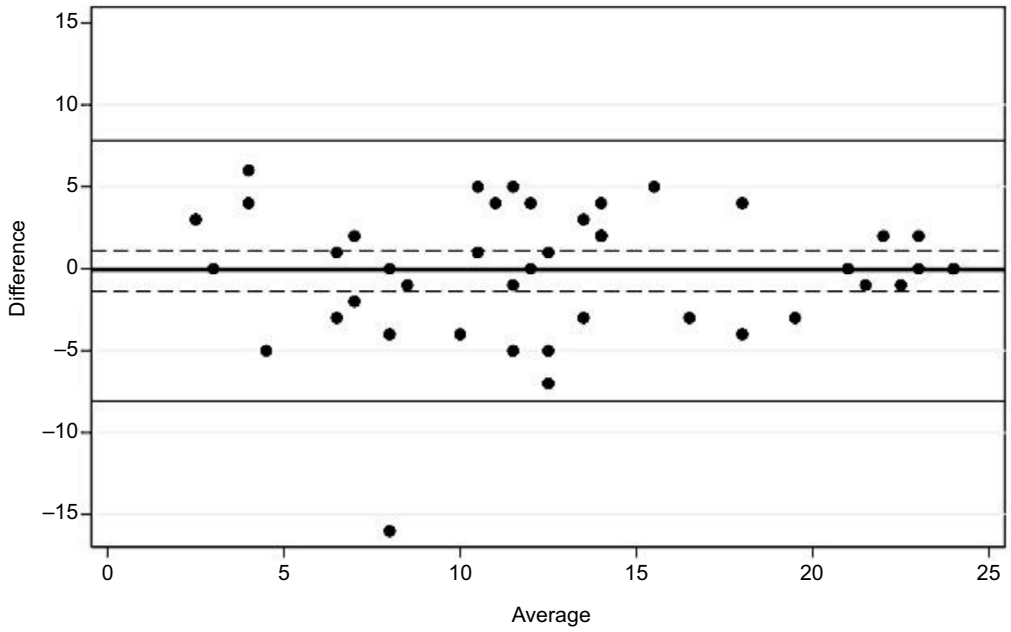

Figure 1 Bland–Altman plot.
Notes: Intraindividual differences between the Fear-Avoidance Belief Questionnaire for physical activity (FABQ-PA) scores on test and retest plotted against the average of scores. The center line represents the mean difference with 95% CI (dashed lines), and the solid flanking lines represent the 95% limits of agreement.

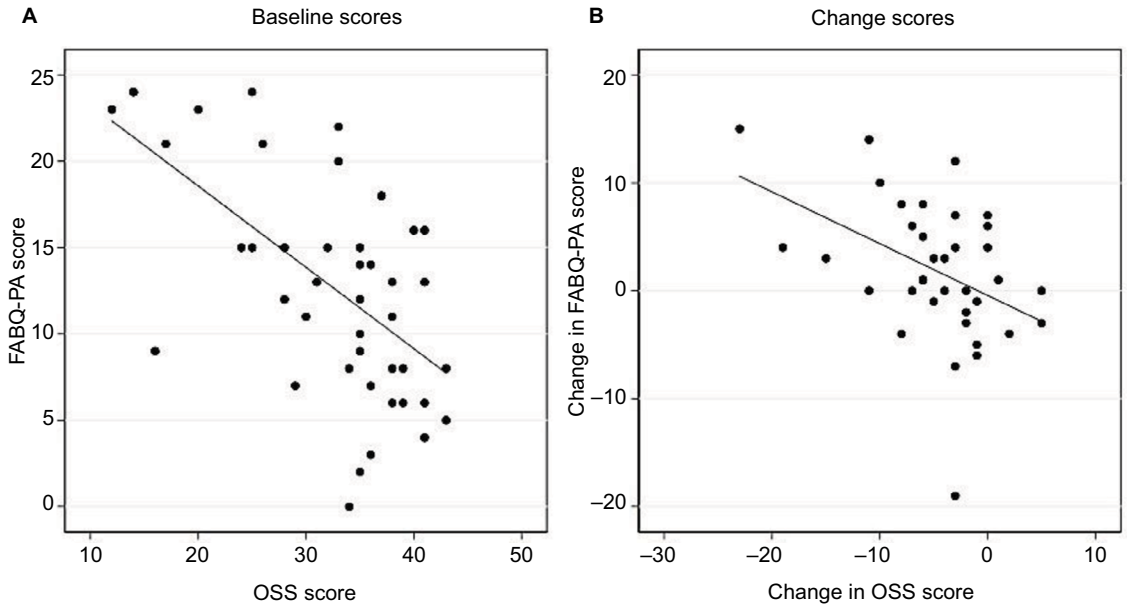

Figure 2 (**A**) Correlation between FABQ-PA scale and OSS at baseline; (**B**) correlation between change scores from baseline to 3 months for the FABQ-PA and OSS.
Abbreviations: Fear-Avoidance Belief Questionnaire for physical activity; OSS, Oxford Shoulder Score.

present study include that our findings may be generalized only to patients with symptoms of SIS. Another limitation is that the time interval between T0 and T1 was shorter than what was suggested by one author,[15] while others[16] proposed time intervals similar to those used in the present study. The time interval was chosen in order to minimize changes in the patients' clinical condition, as all patients were attending physiotherapy treatment. Additionally, it was determined that the time interval was long enough to minimize recall bias. Finally, a limitation is that the sample size in the present study did not completely fulfill general recommendations for method-comparison studies.[8] This may have affected the precision of our estimates.

Conclusion

The present study found acceptable test–retest reliability and confirmed construct validity of the Danish version of the FABQ-PA in patients with symptoms of SIS. However, the FABQ-PA questionnaire may be more suited for group evaluation than individual patients, and the relatively large measurement error and low responsiveness needs to be taken into account when evaluating change over time.

Ethics approval and informed consent

The study was approved by the Danish Data Protection Agency (2015-41-4343), and all participants signed written informed consent forms. The Regional Research Ethics Committee determined that formal ethical approval was not required for this study.[17]

Data sharing statement

The data set from the current study cannot be made publicly available according to Danish regulations. Data are however available from the authors upon reasonable request and permission of the Danish Data Protection Agency.

Author contributions

Both authors contributed toward data analysis, drafting and critically revising the paper, gave final approval of the version to be published, and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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