The Fear Avoidance Beliefs Questionnaire (FABQ): does it really measure fear beliefs?

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Abstract

Study Design: A cohort study with 12 months of follow-up.

Objective: To assess 1) the unidimensionality of the Fear-Avoidance Beliefs Questionnaire (FABQ) and 2) whether single questions in the FABQ predict future sickness absence as well as the whole scale.

Summary of the Background Data: The fear-avoidance model is a leading model in describing the link between musculoskeletal pain and chronic disability. However, reported measurement properties have been inconsistent regarding the FABQ.

Methods: Individuals (n=722) sick listed due to musculoskeletal, unspecified or common mental health disorders undergoing rehabilitation was included. A Rasch analysis was applied to evaluate the measurement properties of FABQ and its two subscales (physical activity and work). Linear regression was used to assess how well single items predicted future sickness absence.

Results: The Rasch analysis did not support the FABQ or its two subscales representing a unidimensional construct. The 7-point scoring of the items was far too fine meshed and in the present population the data only supported a yes or no or a 3-point response option. The items were invariant to age, whereas two of the items revealed gender differences. The item "I do not think that I will be back to my normal work within 3 months" was the best predictor of future sickness absence. Adding the item "I should not do my regular work with my present pain" improved the prediction model slightly.

Conclusions: The FABQ is not a good measure of fear-avoidance beliefs about work or physical activity, and the predictive property of the FABQ questionnaire is most likely related

to expectations rather than fear. Based on these results we do not recommend using the FABQ to measure fear-avoidance beliefs.

Keywords: return to work, sick leave, musculoskeletal diseases, mental health. Rasch analysis

Introduction

The fear-avoidance model is a leading model in describing the link between musculoskeletal pain and chronic disability[1,2]. Central in this model is fear that activity will aggravate pain[1]. Based on experiences of how physical activity affects their pain, patients develop fear-beliefs about pain and its consequences, which may lead to avoidance of activities, inactivity and reduced functioning[2,3].

The Fear-Avoidance Beliefs Questionnaire (FABQ) aims not only to measure fear-avoidance beliefs, but also to identify patients who are at risk for long-term disability[3]. The FABQ, although originally developed for low back pain, has later been evaluated for other populations and is now widely used[4-7]. Several studies have showed that the FABQ, particularly the work-subscale, is a good predictor of future work outcomes[8-11], and is thus much used in the clinic and in research.

However, measurements properties of the FABQ have been inconsistent[12-16]. Conventional factor analysis of the FABQ have supported a two-factor structure of physical activity and work[3]. In contrast a study by Meroni et al.[15], applying Rasch methodology, indicated that neither of the four items comprising the physical activity subscale nor the seven items comprising the work subscale of the FABQ, supported a underlying unidimensional construct. Hence, the study did not support the questionnaire as a general measure of fear-avoidance beliefs.[15]. Furthermore, their study indicated the 7-point Likert scaling of the items was far too fine-meshed. The advantage of the Rasch approach, compared to conventional factor analysis, is the lack of assumption of equal intervals of the scoring options and parametric based statistics. In addition, the Rasch approach allows for evaluation of patients

and items on the same metrics, and items work in the same way when comparing different sample groups[17,18].

One of the questions in the FABQ regards expectations about length of sick leave ("I do not think I will be back to my normal work within 3 months"). Expectations is one of the most consistent predictors of return to work (RTW)[19-22]. If this question is the main predictor and the remaining 10 questions in FABQ do not contribute substantially, this may explain the low responsiveness of the questionnaire[12,13]. Hence, the aims of this study were to assess the unidimensionality of the FABQ using a Rasch analysis and to assess whether single questions in the FABQ predict RTW as well as the whole scale.

Materials and Methods

Study design

A cohort study with 12 months of follow-up. Participants were individuals participating in one of three randomized trials evaluating the effects of occupational rehabilitation programs on RTW. The ARIS project compared outpatient work-focused rehabilitation to multidisciplinary rehabilitation[23], while the Hysnes project compared two different inpatient occupational rehabilitation programs to outpatient acceptance and commitment therapy (in two randomized trials)[24]. The studies were approved by the Regional Committee for Medical and Health Research Ethics in Central Norway (No.: 2012/1241) and evaluated by South-East Norway (S09024b 2009/1000).

Participants

Sick listed workers aged 18 to 60 years were recruited in all trials. The ARIS project recruited patients referred for diagnostic assessment or multidisciplinary treatment for neck and/or back pain at St Olavs Hospital and Oslo University Hospital. Participants had to be employed or self-employed and sick listed from 1 to 12 months. In the Hysnes project, potential participants were identified through the Norwegian Labor and Welfare Service. Participants had to be sick listed from 2-12 months (at least 50% if graded sick leave) with a diagnosis within the musculoskeletal (L), psychological (P) or general and unspecified (A) chapters of ICPC-2 (International Classification of Primary Care, Second edition).

Common exclusion criteria for the two projects were serious somatic and psychological disorders, specific disorders requiring specialized treatment, pregnancy and insufficient Norwegian language skills to participate in the programs. For the ARIS project, further exclusion criteria included legal labor dispute and DSM-V diagnosed mental disorders. In the Hysnes project, alcohol and drug abuse and scheduled surgery within the next 6 months were additional exclusion criteria.

The rehabilitation programs

The different programs have been described extensively[23,24]. Briefly, the work-focused program in the ARIS project consisted of a 5-6 days group-based multidisciplinary program with focus on the RTW process and on reducing fear-avoidance beliefs about work. The program included individual appointments with a caseworker and creating a RTW-plan. The comparative arm consisted of a comprehensive multidisciplinary program consisting of both cognitive behavioral therapy and exercise or a brief intervention focused on diagnostic clarification and encouraging physical activity[23]. In the Hysnes project, the inpatient, multimodal groups-based programs consisted of acceptance and commitment therapy, exercise, work-related problem solving and creating a RTW-plan. One program lasted 3.5

weeks and the other 4+4 days (with two weeks at home in-between). The comparative arm in both these trials were outpatient acceptance and commitment therapy. The participants in this intervention were offered 2.5 hour-long group sessions once a week during six weeks; one group session with psychoeducation on physical activity, 2 individual sessions with a social worker; and a short individual closing session with the group therapist (a psychologist or a medical doctor)[24].

Questionnaires

Self-reported fear-avoidance beliefs were recorded using the FABQ[3] at inclusion in all trials. The FABQ consists of two subscales: 1) a 7-item work subscale (FABQ-W, range 0-42), and 2) a 4-item physical activity subscale (FABQ-P, range 0-24). Each item on the two subscales is scored on an ordinal 7-point Likert-type scale. In the Hysnes project the questionnaire was modified, to make the questionnaire usable for participants with other complaints than back pain: “complaints” replaced “pain” and “body” replaced “back”.

Other variables registered by questionnaires at inclusion were anxiety and depression symptoms (measured using The Hospital Anxiety and Depression scale (HADS)[25]), pain level and level of education.

Sick leave register data

Sick leave was measured using data from the Norwegian Labor and Welfare Service, where all individuals receiving any form of sickness absence or disability benefits in Norway are registered. The data consisted of all registered medical benefits individually traceable for each participant by their social security number. Number of sickness absence days was

91 measured as the number of days receiving medical benefits during 12-months of follow-up
92 after inclusion (adjusted for graded sick leave).

93

94 **Statistical analysis**

95 A Rasch analysis[26], the partial credit model[27], was applied to evaluate the measurement
96 properties of FABQ and its two subscales FABQ-P and FABQ-W. All items originally
97 scored on a 7-point scale were analyzed regarding the thresholds between the scoring
98 points/levels. If the threshold were disordered, i.e. the score levels did not separate the level
99 of the underlying construct, the responses were rescored. Local dependency of the items was
100 evaluated using a correlation analysis of the residuals of the items. A coefficient of 0.2 was
101 chosen as the threshold value to indicate that the responses to two items were dependent on
102 each other[28].

103 Fit to the Rasch model was investigated for the items and individual participants and by a
104 final summary fit for all 11 items in FABQ and for each of the two subscales. The fit of the
105 items was statistically evaluated using standardized residuals and Chi square statistics
106 according to the weighted maximal likelihood method with residuals < ±2.5 and a non-
107 significant Chi-square probability accepted as fit to Rasch Model. The overall summary fit of
108 FABQ and the subscales was evaluated using the Chi square item trait interaction statistics
109 (X^2). The probability level of 0.05 chosen with Bonferroni adjustment for four items in the
110 FABQ-P and seven items in FABQ-W. A non-significant probability value indicates a fit to
111 the Rasch model[29].

112 Invariance across age (dichotomized into groups below and above the median age of 43
113 years), gender and Hysnes/ARIS project was examined using a Differential Item Functioning

(DIF) analysis. A DIF is assessed by an analysis of variance for each item, comparing the scores across each level of gender and age[30]. The Rasch analysis were performed in RUMM 2030 (RUMM laboratory, Perth, Australia).

Linear regression and adjusted R^2 were used to compare how well single items predicted future sickness absence compared to the FABQ subscales. Only participants with no missing data on the FABQ were included in these analyses. The following models were compared: 1) including the two subscales, separately, 2) including the different FABQ single items separately and 3) adding the single items one at the time, successively according to their explained variance (adjusted R2). All the FABQ measures were included as continuous variables. The analyses were adjusted for age, gender, education and project (i.e. ARIS and Hysnes). Age was included as a continuous variable. Education was dichotomized as high (college/university) or low. In a sensitivity analysis, the analyses were stratified by project (Hysnes and ARIS). The linear regression analyses were done using STATA 14 (StataCorp. 2015. Stata Statistical Software: Release 14. College Station, TX: StataCorp LP).

Results

A total of 722 participants answered the FABQ (the ARIS project n=398; the Hysnes project n=324) and were included in the study (table 1). The mean age was 43 years old (SD 10) and 61% were women. The mean FABQ-W score was 25.0 (SD 11.1) and the mean FABQ-P 11.6 (SD 6.6). Median number of sickness absence days during 12 months of follow-up was 147 (interquartile range 66-269).

TABLE 1 ABOUT HERE

The Rasch analysis

The Rasch analysis revealed disordered thresholds in all items (table 2), and only 1-2 thresholds were detectable for each of the items. The revised scoring options with 2-3 points are given for all items (table 2).

TABLE 2 ABOUT HERE

The 11 items of FABQ did not fit the Rasch model despite rescoring all the items with disordered thresholds (X^2 =274.46, p<0.001). The subscales of FABQ-P and FABQ-W were subsequently analyzed separately with none of them fitting the Rasch model. The FABQ-P (X^2 =141.10, p<0.001) revealed 3 out of 4 items not fitting the Rasch model whereas the FABQ-W subscale (X^2 =241.07, p<0.001) revealed 3 out of 7 items not fitting (table 2). Deleting these items and running the Rasch analysis with 4 items (5, 7, 9 and 10), provided low power of analysis as well as indicating additional misfit of item 9 and 10. Item 3 and 4 in the FABQ-P subscale and item 6 and 8 in the FABQ-W subscale showed local dependency with residual correlations above 0.2, and there were in total 16 negative residual correlations, all confined to the FABQ-P subscale. All items revealed invariance to age, but DIF by gender was found for item 2 and 9. DIF was identified by the ARIS/Hysnes project in item 2, 9 and 11. Hence, the Rasch analysis was conducted separately for the ARIS (n=398) and Hysnes

(n=324) without identifying items fitting the FABQ total scale or its subscales FABQ-P and FABQ-W and with similar results.

The Linear Regression Analyses

Two models containing single items (Q10 and Q11) from the questionnaire showed greater explained variance in future sickness absence days than the other items and the FABQ subscales (table 3). The model including the question "I do not think that I will be back to my normal work within 3 months" (Q11) had the highest adjusted R^2 (0.116), closely followed by the question "I should not do my normal work with my present pain" (Q10) (R^2=0.115). The model including the whole FABQ-W subscale was slightly poorer with an adjusted R^2 of 0.111.

Combining the two questions with the highest adjusted R^2 in the same model provided greater explained variance (R^2 =0.150) than including the items separately. Adding more items only negligibly increased the explained variance (table 3). The sensitivity analyses stratified for project showed in general larger explained variances for the Hysnes project than ARIS, but the conclusions did not change (results not shown).

TABLE 3 ABOUT HERE

Discussion

Based on the results of the Rasch analysis, the FABQ does not represent a unidimensional construct, neither do the FABQ-P- nor the FABQ-W subscale. Two of the single items explained more variance in future sickness absence than the subscales. The item "I do not think that I will be back to my normal work within 3 months," explained most of the variance in future sickness absence. The model was only slightly improved by adding the item "I should not do my regular work with my present pain".

The lack of fit of FABQ to the Rasch model in this study is in line with a previous Rasch analysis by Meroni et al.[15], on the Italian version of FABQ for patients with low back pain. They also found that the FABQ does not represent a unidimensional construct, but rather multidimensional constructs. The results of the present study corroborate these results in a broader target population, including participants with both musculoskeletal complaints and mental health problems. More recent studies based on conventional factor analysis also do not support a two-factor structure of FABQ[6,31,32]. From a measurement point of view, there are several challenges with the FABQ. Invariance of a measurement to demographic characteristics of a population is necessary to provide a valid sum score across these factors[33,34]. FABQ was invariant to age, whereas two of the items revealed gender differences. Invariance can be overcome by splitting the item and may not necessarily be replicated in another population sample. A larger problem for FABQ was overlapping content of items which contributed to lack of fit to the Rasch model[35]. Item 3 "I should not do physical activities which make my pain worse" and item 4 "I cannot do physical activities which make my pain worse" in the FABQ-P subscale had a residual correlation above 0.2 indicating overlap in content of these two items. The same problem was revealed for item 6 "My work aggravated my pain" and item 8 "My work makes or would make my pain worse"

in the FABQ-W subscale. These overlaps in content may not be surprising, given the wording of these items. In addition, to contribute to misfit to the Rasch model, overlap between items reduces the variance in the measurement[36]. Furthermore, the 7-point scoring of the items was far too fine meshed. At least the data from the present population only supported a yes or no or a 3-point response option. These results may explain why previous studies have found low responsiveness for the FABQ[12,13].

The findings of this study suggest the FABQ is not a suitable questionnaire for measuring fear avoidance beliefs. As the Tampa scale for kinesiophobia has been shown to capture a unidimensional construct[37], it probably is a better choice regarding measurement properties. However, there is an ongoing debate for both measurements regarding which factors on the fear anxiety spectrum they capture[16,38]. On the other hand, none of them seems to correlate with more objective pain response measurements[39].

The question exhibiting the largest explained variance for future sickness absence was the question “I do not think that I will be back to my normal work within 3 months”. This is not surprising, as expectations repeatedly has been shown to predict future sick leave[19-22]. However, this might suggest that the predictive properties of the FABQ is not related to fear, but rather to expectations. The question with the second largest explained variance was “I should not do my normal work with my present pain”. This question is more in line with the fear avoidance belief model.

The main strengths of this study is the large sample size and the use of registry data for sick leave measurements, ensuring no recall bias or loss to follow-up. A limitation in this study is the use of a modified version of the FABQ questionnaire in one of the projects (Hysnes).

224 However, the performed sensitivity analyses stratified for project did not change any
225 conclusions.

226 In summary, the FABQ does not represent a unidimensional construct for fear-avoidance
227 beliefs about work or physical activity. Two of the single items in the FABQ explain the most
228 variance in future sickness absence. One of these items is a question about the patient's
229 expectations about RTW, i.e. the predictive property of the FABQ questionnaire is most
230 likely related to expectations rather than fear. Based on these results, we do not recommend
231 using the FABQ to measure fear-avoidance beliefs.

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Conflict of Interest: None declared.

Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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