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General and Specific Self-efficacy Reports of Patients with Chronic Low Back Pain: Are They Related to Performances in a Functional Capacity Evaluation?

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Abstract *Introduction* The objective of this study was to analyze the relationship of general and specific self-efficacy (SE) beliefs with functional capacity evaluation (FCE) performances in patients with chronic non-specific low back pain (CLBP), while controlling for influence of gender, age, and self-reported pain intensity, self-esteem, disability, psychosocial distress and health status. *Methods* Included were 92 patients with CLBP referred to an outpatient university based multidisciplinary pain rehabilitation program in The Netherlands. All patients underwent an FCE. General SE was measured with the ALCOS questionnaire prior to the FCE, specific SE was measured with a self-constructed standardized question during the FCE. Paired samples t-tests were used to tests differences between predicted and actual performances. Pearson and Spearman rank correlation coefficients were used to express the strength of the relationships between SE and performances. Multivariate analyses were used to test the influence of control variables on the relationships between SE (general or specific) and performances. *Results* Performances were consistently higher than patients' self-predictions. Differences between predictions and performances were significant in male lifting low, male carrying, and female carrying. With exception of the association between specific SE and lifting in males ($r = 0.55$, $P < 0.05$), all other correlations between general and specific SE and FCE performances were non-significant. Multivariable regression analyses showed that the relative contribution of SE measures over gender was little or none. *Conclusions* The contribution of specific SE to the prediction of FCE performances is moderate in one instance, and insignificant in most instances (both specific and general SE). Because of the consistency of the differences between prediction (specific SE) and performances, and depending on the level of accuracy needed, future research may deliberate the use of predicted material handling capacities at group level and correct for a systematic underprediction.

Keywords Chronic low back pain · Lifting · Psychological factors · Occupational rehabilitation

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Introduction

Functional Capacity Evaluations (FCEs) are batteries of tests aimed to measure a person's performance of work-related tasks. Actual performance of patients with chronic non-specific low back pain (CLBP) during an FCE may depend on several factors. Seen from the biopsychosocial model, a patient's performance during an FCE may depend on biological, psychological and social factors. One of the psychological factors is self-efficacy expectations (SE). SE refers to an individual's beliefs in one's competence or ability [1]. The SE theory draws from social learning theory, in which cognitive processes (beliefs, attitudes), behavior, and environmental factors are seen as influencing one another to shape health behaviors. SE is embedded in the theory of planned behavior model (TPB).

In the TPB it is assumed that intention to demonstrate a behavior is an important predictor for the actual behavior [2]. Intentions reflect the effort that people plan to behave in the valued direction and they are a function of three determinants [3]. The first determinant is the person's attitude toward the behavior, that is, the positive and negative evaluation of the behavior. The second determinant is the subjective norm, which reflects the person's perception of social pressure regarding the behavior. The third determinant is the perceived behavioral control (PBC), which is the person's perception of ease or difficulty of the behavior [4]. PBC is related to SE [5], referring to perceptions of control over internal resources, but also comprises an external concept, which refers to perceptions of control over environmental constraints on behavior [6, 7]. PBC is supposed to influence behavior both indirectly (via intention) and directly. That is, people will more likely be motivated to demonstrate a behavior (i.e., to form intentions) if they think the behavior is under their personal control. In addition, holding intention constant, individuals with high levels of PBC will be more likely than others to demonstrate the behavior [4]. Applying this model to FCE, it is assumed that patients with low levels of SE are less likely to perform well on the tasks presented, and patients with high levels of SE are assumed to perform better.

Although SE has been reported on quite extensively in the chronic (low back) pain literature, its specific relationship with performances during FCE in patients with chronic (low back) pain has been studied scarcely. While the amount of studies may be limited, the strength of the relationships between SE and FCE performances vary. Significant correlations have been reported that range between $r = 0.43$ and 0.73 [1, 8–11], but weaker and insignificant correlations are reported as well [10]. Functional SE was found a better predictor of lifting tasks than either of the perceived pain control measures or psychological distress in one study [1], but were found to be non-predictive in another study (Schiphorst et al. submitted). In the literature reviewed, different instruments were used to measure SE. It has been suggested that for SE beliefs to be predictive of task performance, its questioning should closely resemble the task measured [8]. In this study, this is referred to as specific SE. However, although intuitively correct, the hypothesis that specific SE is a better predictor of task performance than general SE has not been tested within an FCE context in a single sample of patients. The extend of improved predictive power of specific over general SE beliefs is unknown.

The objective of this study was to analyze the relationship of general and specific SE beliefs with FCE performances in patients with CLBP, while controlling for influence of gender, age, and self-reported pain intensity, self esteem, disability, psychosocial distress and health status.

Methods

Patients

Ninety-two consecutive patients, who were referred for an outpatient multidisciplinary pain management program in the Center for Rehabilitation, University Medical Center Groningen, the Netherlands, and who agreed to participate, were included in this study. Patients were referred by general physicians or medical specialists. All patients had signed informed consent. Inclusion criteria were: non-specific low back pain lasting 3 months or longer, age between 18 and 65 years, and no longer than 1 year out of work due to CLBP. Exclusion criteria were: CLBP with an underlying specific medical cause, co-morbidity with severe negative consequences for physical and/or mental functioning, addiction to drugs, or psychopathology and insufficient knowledge of the Dutch language. This study was part of a larger study program, LOBADIS (Low Back Pain and Disability), for which approval was granted by the Medical Ethics Committee of the University Medical Center Groningen.

Procedures

Prior to the treatment program patients completed questionnaires assessing demographic data, patients' characteristics, disability and psychosocial variables, including a questionnaire on general self-efficacy. Additionally, patients performed tests according to the modified WorkWell FCE. Questions regarding specific self-efficacy were asked during the FCE.

Measures

Dependent variables

Performance-based disability was measured with the modified WorkWell FCE. An FCE is performance-based measurement of a person's work ability. Modifications to the original FCE were that sitting and standing tolerance were not tested, and all tests were performed on 1 day (original: 2 consecutive days). The material handling subtests from the FCE were selected for analyses: lifting low, overhead lifting, carrying two handed. These tests measure in a standardized matter in an incremental protocol the maximum amount of weight a person can lift or carry. A description of the tests is published elsewhere [12, 13].

Test-retest and inter- and intra-rater reliability of these tests were established in patients with CLBP [12–17]. Safety of the FCE appears good in patients with CLBP [18]. All patients were tested by a physical therapist who was trained, certified and experienced in administering FCEs. The tester was blinded to the questionnaire scores (including general SE), but was not blinded to the specific SE score.

Independent variables

General self-efficacy (SE) was measured with the Dutch Version of the General Self Efficacy Scale ('Algemene Competentie Schaal'; ALCOS Short Form) [19]. The ALCOS measures the subject's expectations of their capacities in general (16 items). Scores range from 100 to 500, with higher scores representing better expectations. Next to the general score, three subscales are distinguished: willingness to initiate behavior, willingness to expend effort in completing the behavior, and persistence in the face of adversity [20]. The validity of the ALCOS appears to be good [19, 21]. Specific SE was measured during the FCE with the use of self-constructed measure. The evaluator verbally instructed the patient on how to perform the test and briefly demonstrated the task. Before actual performance, the patient was verbally asked a standardized question (in Dutch): 'expressed in kg, how much do you expect to lift (or carry)?' Because this measure for specific SE was developed pragmatically, similar to the methods of Asante et al. [8] and as suggested by others [22], the psychometric properties of this measure are unknown. No feedback was provided to the patient as to how his prediction or performance compared to others. The weights consisted of pieces of solid steel that weighted 4, 2 or 1 kg. The patients were able to see how many pieces of steel were in the crate, but were unaware of the amount of weight it represented.

Control variables

Current pain intensity was measured with a 100 mm Visual Analogue Scale, ranging from no pain (0 mm) to unbearable pain (100 mm). Self-reported disability for daily living activities, including work, was measured with the Roland Morris Disability Questionnaire (RMDQ), a health status measure to assess self-reported disability due to low back pain [23]. The RMDQ consists of 24 items. Each item is qualified with the phrase 'because of my back pain'. Patients were asked to check if it applied to them the past few days. The RMDQ score was calculated by summing the items checked. The scores range from 0, representing no disability, to 24, representing severe disability [23]. Construct validity, internal consistency and reproducibility of the RMDQ are good [24]. The Dutch version of the RMDQ has proven to be a reliable instrument to measure self reported functional status in CLBP patients [25]. The impact of illness on a patient's health-related quality of life was measured with the SF-36, a generic measure which covers 9 domains of health-related quality of life. Composite physical and mental scores were obtained, with scores ranging from 0 to 100 (higher scores indicate better health status). The SF-36 internal reliability, construct validity and changes in disease-related symptoms over time has been well documented [26]. Psychosocial distress was measured with the Symptom Checklist-90-Revised (SCL-90-R; 90 items). The total score, the Global Severity Index (GSI) reflects the severity of all answered statements as a global measure of distress. GSI scores range from 0 to 360, with higher scores indicating higher psychosocial distress [27]. Reliability and validity are good [27, 28]. Self-esteem was measured with the Dutch version of the Rosenberg Self-Esteem Scale (SES). It consists of 10 items, 5 of them positively worded and 5 negatively worded. A positively worded item is for example: 'I feel good about myself'. A negatively worded item is for example: 'I certainly feel useless at times'. Scores range from 0 to 40, with higher scores indicating higher self-esteem [29]. Reliability and construct validity are satisfactory [29].

Statistical analysis

All statistical analyses were performed with SPSS, version 11.5 for Windows. All data were measured at the interval level. The distribution of the data was checked for normality Kolmogorov-Smirnov Test. Depending on normality of distribution, Pearson's or Spearman's rank correlation coefficients were used to express the strength of the relationships between independent and dependent and control variables. Paired samples t-tests were used to tests differences between predicted and actual performances. Multivariate analyses (model enter) were used to test the influence of control variables on the relationships between SE (general or specific) and performances. Interpretation of correlation coefficients: $r < 0.49$ weak relationship; $0.50 < r < 0.74$ moderate relationship; $r < 0.75$ strong relationship [30]. All tests were interpreted as statistically significant when $P < 0.05$.

Results

The study sample consisted of 92 patients, of which 60 were male and 32 were female. Descriptive data of the patients are presented in Table 1. All data was distributed normally, with exceptions of SE lifting high and carrying

Table 1 Descriptive statistics of the patient sample (n = 92 patients with CLBP)

	All		Males		Females		Sign
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	
Age (years)	99	38.4 (8.7)	60	38.1 (8.3)	32	38.9 (9.5)	–
Pain intensity (0–100 mm)	92	49 (21)	60	52 (21)	32	45 (29)	–
SCL90 (90–360)	86	124 (20)	56	123 (21)	30	124 (23)	–
RMDQ (0–24)	92	12.6 (4.8)	59	12.6 (5.0)	32	12.5 (4.5)	–
SF36 physical (0–100)	86	43.5 (14.4)	56	43.6 (13.2)	30	43.2 (16.6)	–
SF36 mental (0–100)	85	65.0 (20.0)	55	64.4 (21.4)	30	65.9 (17.5)	–
ALCOS standardized (100–500)	86	411.3 (53.6)	54	412.1 (48.6)	32	410.1 (61.7)	–
Rosenburg SES (0–40)	86	33.5 (4.2)	55	33.4 (4.2)	31	33.6 (4.0)	–
Performance lifting low (kg)	92	28.0 (14.7)	60	32.9 (15.3)	32	18.8 (7.8)	*
Performance lifting high (kg)	89	15.6 (6.3)	57	18.4 (6.1)	32	11.4 (3.5)	*
Performance carrying (kg)	88	31.8 (16.5)	56	36.7 (17.6)	32	24.4 (11.4)	*
SE lifting low (kg)	53	20.3 (12.2)	32	24.8 (11.6)	21	13.6 (9.8)	*
SE lifting high (kg)	51	13.2 (8.6)	30	15.0 (7.2)	21	10.5 (9.9)	–
SE carrying (kg)	64	22.3 (16.0)	41	26.2 (17.9)	23	16.8 (9.0)	*

* Differences between males and females are significant ($P < 0.05$); SCL90, Symptom Checklist-90-Revised; RMDQ, Roland Morris Disability Questionnaire; SES, Self-esteem scale; SE, self-efficacy

(median scores 10 and 20 kg respectively). All performances were higher than patients' self-predictions. Differences between predictions and performances were significant in male lifting low, male carrying, and female carrying. Correlations between general and specific SE (independent variables) and control variables on the one hand and FCE performances (independent variables) on the other hand, are presented in Table 2. Correlations between general SE and specific SE were non-significant ($r = -0.001$ to -0.167). Correlations between the three self-efficacy subscales and performance measures were all non-significant (ranging from $r = -0.14$ to 0.02).

The results of the multivariate regression analyses are presented in Table 3. Presented are results of the SE measures (regardless of significance) and additional variables that would have contributed significantly to a model. SE measures did not contribute significantly to the prediction models, with the exception of specific SE in the lower lifting test. Gender contributed significantly in all tests. None of the other predictors contributed significantly to the models.

Table 2 Correlations between general and specific self-efficacy (SE) (independent variables) and control variables on the one hand and FCE performances (independent variables) on the other hand

	Correlation with performances (independent variables)		
	Lifting low	Lifting high	Carrying
Dependent variables			
Specific SE: prediction[a]	0.55*	0.27	−0.13
General SE: ALCOS	−0.02	0.14	0.04
Control variables			
Age (years)	−0.03	<0.01	−0.12
Pain intensity (0–100)	0.13	−0.01	0.02
SCL90 (90–360)	−0.01	−0.04	−0.06
RMDQ	−0.22*	−0.19	−0.29*
SF36 physical	0.13*	0.19*	0.25*
SF36 mental	0.03	0.12	0.20
Rosenburg SES	−0.03	0.09	0.05

* $P < 0.05$

[a] Correlation coefficients reflect correlation between predicted performance and actual performance of the item indicated in the column ($r = 0.55$ reflects correlation between predicted lifting low performance and actual lifting low performance)

SCL90, Symptom Checklist-90-Revised; RMDQ, Roland Morris Disability Questionnaire; SES, Self-esteem scale; SE, self-efficacy

Discussion

The results of this study indicate that FCE performances on the lifting test are moderately related to specific SE, as measured with a self-constructed question prior to actual performance. Performances on the two other tests were unrelated to specific SE. FCE performances are unrelated to general SE, as measured with the ALCOS, nor with its subscales. The multivariable regression analyses revealed little extra information. The relative contribution of SE over gender was little or none. Thus, it appears that the contribution of SE to the prediction of FCE performances

Table 3 Results of the multivariate regression analyses. Presented are results of both self-efficacy (SE) measures and any control variable that contributed significantly to the model

Dependent variable	Predictor	Standardized ß	P	95% CI for B
Lifting low (kg)	General SE	−0.20	0.22	−0.15 to 0.04
	Specific SE	0.53	<0.01*	0.32 to 1.06
	Gender (male = 1)	0.28	0.04*	0.41 to 17.6
Model adjusted $R^2 = 0.51$				
Lifting high (kg)	General SE	−0.08	0.67	−0.05 to 0.03
	Specific SE	0.15	0.35	−0.12 to 0.37
	Gender (male = 1)	0.51	<0.01*	2.50 to 9.73
Model adjusted $R^2 = 0.37$				
Carrying (kg)	General SE	0.18	0.33	−0.05 to 0.15
	Specific SE	−0.18	0.24	−0.45 to 0.12
	Gender (male = 1)	0.44	0.01*	4.45 to 23.01
Model adjusted $R^2 = 0.26$				

* Indicates significant contribution to the model ($P < 0.05$)

is moderate at best (in one instance), but insignificant in most instances.

Only one other report could be traced in the literature dealing with SE in a specific FCE context [8]. In general, it appears that the FCE results in this study were less dependent on (functional) SE than reported by Asante et al. Patient samples appear relatively similar with regards to age, gender, diagnosis, self-reported disability, pain intensity and overall physical health. Additionally, test protocols were similar. In contrast to the Asante study, however, the tester was not blinded to the patient's specific SE score, and this might have influenced the results. Additionally, the patient may have learned from the first test, and this learning effect could have influenced his second and third specific SE and FCE performances. Theoretically, if this happened, we should have seen an increased strength of correlations between specific SE and performances along progression of the FCE (test sequence: lifting low, lifting high, carry). Because the opposite occurred (Table 2), it is unlikely that tester and patient were influenced. Differences were seen in absolute performances, which is consistent with earlier reports [31]. However, even though relationships between SE and performances may differ between the reports, a general pattern can be seen in the relative positions of predicted performances and actual performances. Asante et al. report that patients' mean predictions were 72–84% of their mean performances, and in this study patients' mean predictions were 70–85% of their mean performances. In contrast, healthy subjects' mean predictions were 83–94% of their mean performances (Asante). Depending on the level of validity needed, future research may deliberate the use of predicted material handling capacities at group level and correct for the systematic underprediction as reported on in this and Asantes' report. While there is a consistent mean difference at the group level, the low correlation coefficients observed imply that there is no systematic relationship between prediction and actual capacity. If there is no systematic relationship, *individual* estimates based on group data will be incorrect. The finding that patients' self-report of predicted capacities are lower than healthy subjects' self-report of capacities have been reported on by others as well [32]. Whether it is more difficult for patients to predict their performances than healthy individuals, and the magnitude of SE and other psychological and/or social variables in this prediction remains difficult to analyze from this or Asantes' [8] study.

In other research performed by our group, general SE measured with the ALCOS questionnaire has shown some promising results in predicting time to return to work (RTW) measured in patients who were off work for 6 weeks (Brouwer et al., manuscript in preparation). General SE and FCE, however, have not or weakly been able to explain differences in current work status in patients with CLBP [33]. We hypothesize that the RTW or current work status in patients with chronic health conditions, such as CLBP, is more multidimensional determined than most patients with subacute musculoskeletal pain. SE and functional capacity may be one of the factors contributing to variance in RTW or current work status. Additionally, as suggested by others, SE should be measured RTW-specific [22]. Future research should be performed to tests these hypotheses.

Except for gender and self-reported functional status (RMDQ and SF36 physical correlating weak with performances), none of the control variables was consistently related to performances. The observation in this study that self-reported measures of function related weakly to performance based measures of function appear supportive for the hypothesis that both instruments (self-report and performance based) measure distinctly different aspects of the same construct (physical functioning). While outside the main scope of this study, the relationship between psychological variables (such as, but not limited to, fear-avoidance beliefs) and performance measures is still under study. The proposed relation between fear-avoidance beliefs and FCE performances has not been confirmed consistently [34]. Further research is needed in different settings and countries, because this will enable us to unravel the important question of 'what exactly is being measured in FCE'?

Strength of this study was that SE was operationally defined in two ways: both with an existing questionnaire that measured general SE, and with a specific SE measure. The latter measure however, as was the case in Asantes' study, was pragmatically developed, being very close to what it intended to measure (face validity), but the measure was not psychometrically tested. This may be regarded as a weakness of this study. Analyses were performed on material handling activities only, even though the FCE consists of more activities. Post-hoc analyses on other FCE-activities revealed no different insights (results not shown). However, it has been shown that material handling capacities are greatly predictive of variance in other FCE performances in patients with CLBP. Additionally, at individual level, it has been demonstrated that healthy individuals cannot reliably predict their own performances of other types of activities, such as postural tolerances [35]. We suggest that predictions may improve when reference values are provided to the patient. The patient can mirror his performance to relevant others, compared to 'meaningless' kg-values such as used in this study. Although the results of this study may not be as positive as reported by others, more research should be carried out to this promising field. Promising, because it has been demonstrated that at group level, patients and healthy individuals provide a light to moderate, but consistent underestimation of their material handling capacities. The theory of planned behavior (TPB) may serve as a framework to test and explain patient performances in FCE. If self-report measures can be developed that acceptably estimate functional capacity for individuals also, or if clinical decision rules can be developed to decide which patients should and which patients should not be tested, a further step can be made to improve the utility of FCE.

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