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A Dutch translation of the Self-Efficacy for Rehabilitation Outcome Scale (SER): a first impression on reliability and validity

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Abstract

Self-efficacy is a relevant factor during rehabilitation after total hip or knee arthroplasty. Research was done into the reliability and validity of a Dutch translation of the Self-Efficacy for Rehabilitation Outcome Scale (SER). One hundred and forty-one persons filled in the SER questionnaire and the Self-Efficacy Expectation Scale (SES) as a control scale. Research was done into reliability and into construct- and criterion-related validity. Factor analysis yielded two factors. Pearson's correlation between the two factors was 0.61 ($P < 0.01$). To assess criterion-related validity, the Pearson's correlation coefficient was calculated between the sum score of the SER and the SES. The scales had a correlation of 0.62 ($P < 0.01$). Internal consistency resulted in a Cronbach's coefficient alpha of 0.94 for the entire SER scale, and 0.94 and 0.87 for the first and second factors. It is concluded that for the time being the Dutch version of the SER can be considered a reliable and valid questionnaire.

Keywords: Self-efficacy; Orthopaedics; Total hip arthroplasty; Total knee arthroplasty

1. Introduction

Past research has shown that self-efficacy is a relevant and promising factor in the process of rehabilitation in general [1]. In that sense, research has been done into the role of self-efficacy within a broad spectrum of patients, for example following cardiac surgery, stroke, hip fractures and for chronic arthritis sufferers. From these studies it can be concluded that higher levels of self-efficacy are positively associated with the ability to conduct rehabilitation therapy [2–6]. Within orthopaedics however, research into the role of self-efficacy during rehabilitation is in its infancy. Waldrop and Lightsey [7] and Moon and Backer [8] are among the few who have done research into the role of self-efficacy after reconstructive/replacement hip/knee surgery and total hip/knee replacement, respectively. Pellino et al. [9] are among those rare researchers who have studied the effect of an intervention, in this case a preoperative education program, on self-efficacy in orthopaedic patients. From these few studies within an orthopaedic setting it can be concluded that, as in other patient groups, self-efficacy is positively associated with rehabilitation in patients undergoing total hip or knee arthroplasty.

Self-efficacy is a key concept in Bandura's social-cognitive theory [10]. Self-efficacy encompasses beliefs about an individual's capabilities to produce performances that will lead to anticipated outcomes [11,12]. According to Bandura's social-cognitive theory, environmental factors, personal factors and behavioural attributes influence the actual behaviour of a person. These factors also interact with one another. Thus, for rehabilitation after a total hip or knee arthroplasty, a patient must believe in his ability to perform the desired behaviour during rehabilitation (i.e., the patient must possess self-efficacy), and must perceive an incentive to do so (i.e., the patient's positive expectations of the result of the rehabilitation must outweigh the negative expectations, and the patient must attach value to the expected

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outcomes or consequences of the rehabilitation). Although the term self-efficacy can be used to refer to a general sense of personal competence and effectiveness [13], the concept is most useful when defined, operationalised and measured for a particular behaviour or set of behaviours in a specific context [14–16]. In the case of the present study, this would be self-efficacy in the context of rehabilitation after total hip or knee arthroplasty.

No research has been done in the Netherlands – and little elsewhere – into the development of questionnaires to measure self-efficacy during rehabilitation after total hip or knee arthroplasty. In the English language, only a few questionnaires have been developed. One example is the Self-Efficacy for Rehabilitation Outcome Scale (SER) by Waldrop and Lightsey [7], which measures patients' belief about their ability to perform behaviours typical of physical rehabilitation for knee and hip surgery. A second example is the Self-Efficacy Expectation Scale (SES) by Barsevick [17], which measures older patients' perceived self-efficacy regarding the performance of specific activities that are required in the period following hip surgery and is used in a study by Kurlowicz involving patients undergoing total hip replacement [18]. The SES is based on scales used in previous studies on cardiac, COPD and chronic arthritis patients [11,19,20].

Although little research has been done into the development of scales specific for patients undergoing total hip and knee surgery, insight into patients' self-efficacy can be considered relevant, as it provides insight into patients' beliefs regarding their ability to perform behaviours typical of physical rehabilitation after a total hip or knee arthroplasty. Therefore, the aim of the present study was to translate an existing self-efficacy measure into the Dutch language. As the SER by Waldrop and Lightsey was developed for both knee and hip surgery patients – in contrast with the SES, which was only developed for hip surgery – the first scale was chosen. Research was done into internal consistency as an aspect of the reliability of the Dutch SER, and construct- and criterion-related validity as aspects of its validity.

2. Methods

2.1. Participants

All patients hospitalised at the Orthopaedic Department of Groningen University Hospital between February 2002 and January 2003 for a total hip or knee arthroplasty formed the target group for this study. Both the SER and SES questionnaires were sent to all these patients by mail (N = 174) with the request to fill them in and return them within 2 weeks. After 2 weeks, a phone call was made to non-respondents. Finally, 147 persons responded to our request (a response rate of 80.0%); 141 questionnaires were filled in completely and could be used in the statistical analysis.

The study was executed in accordance with the regulations of the Medical Ethical Board of Groningen University Hospital. With the questionnaires, participants received a letter explaining the aim of the study. Confidentiality was assured. Return of the completed questionnaires was taken as consent to participate.

2.2. Instruments

The Self-Efficacy for Rehabilitation Outcome Scale (SER) developed by Waldrop and Lightsey [7] was translated into Dutch. The 12-item SER was developed following Bandura's guidelines to assess participants' beliefs about their ability to perform behaviours typical of physical rehabilitation for knee and hip surgery. The SER was developed together with rehabilitation psychologists and physical and occupational therapists. Items increase in difficulty (e.g., those items assessing beliefs in a person's ability to stretch her leg to items assessing a person's ability to walk). Additionally, items are included that measure a person's belief in the ability to perform behaviours in varying therapy situations, such as when experiencing pain and emotional distress. Items are rated on an 11-point Likert scale ranging from 0 (I cannot do it) to 10 (certain I can do it). Typical items include 'During my rehabilitation, I believe I can do therapy that requires me to stretch my leg' and 'I believe I can do my therapy regardless of the amount of pain I am experiencing'. Table 2 shows the total of 12 items. The original English-language scale can be considered reliable with a Cronbach's coefficient alpha of 0.94. According to Bandura [10], efficacy scores are summed and then divided by the total number of items to indicate the strength of perceived self-efficacy for the activity.

To measure criterion-related validity, the Self-efficacy Expectation Scale (SES) developed by Barsevick [17] was translated into Dutch. The SES is a 9-item, self-report scale designed to measure older patients' perceived self-efficacy regarding performance of specific activities required in the recovery period following hip surgery. The nine items of the SES describe the individual's confidence in his or her ability to perform specific activities, for example to ambulate, perform self-care tasks, manage the immediate environment and maintain emotional balance. Subjects were asked to rate the extent of their agreement with each statement regarding their belief or confidence in their ability to perform these specific postoperative behaviours. A 5-point Likert scale was used, ranging from strongly disagree (0) to strongly agree (4). Examples of these statements include 'I am confident that I can walk around inside my room easily' and 'I am confident that I can deal with any emotional ups and downs since my surgery'. Table 2 shows the total of nine items. Summing the responses on each item scores the SES. The range of scores is 0–36. For the original English-language scale, Cronbach's coefficient alpha's are reported of 0.90 and 0.88 [17,18]. For both the

SER and the SES, no additional information is available with respect to the validity of the original English-language scales.

2.3. Data analysis

Research was done into aspects of reliability and validity. Reliability is the extent to which the measure will give the same response under similar circumstances [21,22]. Validity refers to whether a measure actually measures what it is supposed to quantify [21–23]. For a test to be valid it must be reliable [22,23].

In this study, research into reliability has been focused on internal consistency. Internal consistency considers the relationship of each item to every other item [24]. Internal consistency was assessed by means of Cronbach's coefficient alpha. In order to gain insight into the validity of the questionnaire, research has been done into construct- and criterion-related validity. Construct validity is determined by judging the extent to which theoretical and statistical information supports assumed constructs [22]. Construct validity was calculated using factor analysis and Pearson's correlation coefficient. Criterion validity is defined as a test's correlation to a specified criterion. Pearson's correlation coefficients were calculated between the sum scores of the SER and SES to assess criterion validity. Statistical analyses were executed with SPSS 10.0.

3. Results

3.1. Main characteristics of the patients

One hundred and forty-one patients filled in the questionnaires completely. Table 1 shows the main characteristics of the participants, who had undergone surgery between 0 and 12 months previously.

Table 1
Main characteristics of the participants

Gender	Mean age (S.D.)	Hip	Knee	Total
Male	60.8 (14.8)	27	7	34
Female	67.6 (12.3)	72	35	107
Total	65.9 (13.2)	99	42	141

3.2. Descriptive statistics of the SES and SER

Table 2 shows the descriptive statistics of the SES and SER self-efficacy items among the 141 patients in our study.

3.3. Reliability and validity

Internal consistency, which was assessed with Cronbach's coefficient alpha, was 0.94 for the SER scale.

To determine construct validity, a factor analysis was carried out. The principal component factor analysis with oblimin rotation and kaiser normalization yielded two factors, each with an eigenvalue greater than 1. Although Waldrop and Lightsey did not execute a factor analysis and did not label the two proposed factors, the first factor can be characterised as 'self-efficacy in overcoming barriers' and the second factor as 'self-efficacy for rehabilitation therapy exercises'. The percentage of explained variance for the first factor was 62.5% (eigenvalue 7.5), and for the second 10.2% (eigenvalue 1.2). Total amount of explained variance for these two factors was 72.7% (see Table 3). Pearson's correlation coefficient between the sum scores of the two subscales was calculated to obtain additional information about the instrument's construct validity. Correlation between the two subscales was 0.61 and significant ($P < 0.01$).

Finally, we calculated the correlation between the sum scores of the SER and the SES to obtain information on

Table 2
Mean score and standard deviations on the items of the SER and SES ($N = 141$)

SER items (range 0–10)	Mean (S.D.)	SES items (range 0–4)	Mean (S.D.)
During my rehabilitation, I believe I can do...		I am confident that...	
1. Therapy that requires me to stretch my leg	7.68 (2.19)	1. I could/can walk around inside mu room easily	2.94 (1.11)
2. Therapy that requires me to lift my leg	7.33 (2.30)	2. I could walk in the hallway easily	2.96 (1.07)
3. Therapy that requires me to bend my leg	7.34 (2.36)	3. I could/can get into or out of the shower easily	2.84 (1.11)
4. Therapy that requires me to stand	7.10 (2.58)	4. I could get assistance from others if I need it	2.98 (0.91)
5. Therapy that requires me to walk	6.89 (2.72)	5. I could/can straighten up my bed area or room if I need to	2.70 (1.19)
6. All of my therapy exercises during my rehabilitation	5.61 (2.79)	6. My hip is healing normally	2.84 (1.08)
7. My therapy every dat that it is scheduled	6.18 (2.74)	7. I can deal with the discomfort I am having from my surgery	2.72 (1.06)
8. The exercises my therapists say I should do, even if I don't understand how it helps me	6.78 (2.23)	8. I can deal with any emotional ups or downs since my surgery	2.66 (1.02)
9. My therapy no matter how I feel emotionally	6.70 (2.29)	9. I can accept help if I need it	3.02 (0.90)
10. My therapy no matter how tired I may feel.	5.79 (2.52)		
11. My therapy even though I may already have other complicating illnesses	5.60 (2.47)		
12. My therapy regardless of the amount of pain I am feeling	5.47 (2.71)		

Table 3
Principal component factor analysis with oblimin rotation ($N = 141$)

Item	Factor 1 Self-efficacy in overcoming barriers	Factor 2 Self-efficacy for rehabilitation therapy exercise
During my rehabilitation, I believe I can do...		
1. Therapy that requires me to stretch my leg	.514	**.908**
2. Therapy that requires me to lift my leg	.535	**.886**
3. Therapy that requires me to bend my leg	.562	**.855**
4. Therapy that requires me to stand	.698	**.733**
5. Therapy that requires me to walk	**.743**	.687
6. All of my therapy exercises during my rehabilitation	**.852**	.572
7. My therapy every day that it is scheduled	**.873**	.612
8. The exercises my therapists say I should do, even if I don't understand how it helps me	**.730**	.675
9. My therapy no matter how I feel emotionally	**.787**	.593
10. My therapy no matter how tired I may feel	**.906**	.482
11. My therapy even though I may already have other complicating illnesses	**.875**	.506
12. My therapy regardless of the amount of pain I am feeling	**.853**	.427

Note: A bold figure indicates the highest loading and therefore the factor to which the item belongs.

criterion-related validity. The scales had a moderate but significant correlation of 0.62 ($P < 0.01$).

4. Discussion and conclusion

4.1. Discussion

We assessed reliability on the basis of the internal consistency of the SER. The internal consistency proved satisfactory for the entire scale ($\alpha = 0.94$). Additionally, we calculated the Cronbach's coefficient alpha for the two subscales separately. Cronbach's coefficient alpha was 0.94 for the first factor and 0.87 for the second factor. All scores satisfied the minimum criterion of 0.80 set by Nunnally and Bernstein [23]. It can be concluded that the Cronbach's coefficient alpha of the Dutch version of the SER was equal to that of the original English version ($\alpha = 0.94$). As Waldrop and Lightsey did not analyse the factor structure of the original English version of the SER, no comparison of the internal consistency of the subscales of the Dutch version with the original SER can be made.

Validity was assessed on the basis of construct- and criterion-related validity. Construct validity was calculated by means of principal component factor analysis with oblimin rotation. This resulted in two factors, each with an eigenvalue greater than one. With respect to the original SER scale, there is no information available about the factor structure. However, the scale was developed with the intention that consecutive items would increase in difficulty (items 1 through 5), and items were included that measured belief in ability to perform behaviours in varying therapy situations, such as when experiencing pain and emotional distress (items 6 through 12). The fact that the Dutch-language scale consists of two subscales can be considered to be in accordance with the intentions Waldrop and Lightsey had when they developed the questionnaire. From the results of the factor analysis, it can be concluded that the first four items load on factor 2 and measure aspects of rehabilitation that increase in difficulty, in the Dutch version of the questionnaire labelled as 'self-efficacy for rehabilitation therapy exercises'. The latter eight items load on factor 1 and reflect the confidence patients have in their ability to perform behaviours in varying therapy situations, such as when experiencing pain and emotional distress, in the Dutch version of the questionnaire labelled as 'self-efficacy in overcoming barriers'. Originally, item number 5 should belong to factor 2, but in our study it loads on factor 1. However, the loading on factor 1 is not much higher than that on factor 2 (0.743 versus 0.687). A probable explanation can be that patients experience item 5 as one of the most difficult of the items of factor 2, as intended by the original developers of the scale, and in that sense experience a kind of barrier with respect to walking. This explanation is further supported by the fact that item number 4, although it loads highest on factor 2, also loads only a fraction lower on factor 1 (0.733 versus 0.698).

To gain insight into criterion-related validity, Pearson's correlation coefficient between the sum scores of the SER and SES was calculated. The scales had a correlation of 0.62 ($P < 0.01$). Strict standards for expressing the degrees of validity are not available. Besides personal characteristics, like age and gender, the chosen criterion measurement is of influence [25]. Depending on the extent to which the criterion measurement measures the same trait, an estimate of the expected correlation can be made. In general, it is assumed that a correlation of 0.3 or lower can be considered low, between 0.3 and 0.6 moderate, between 0.6 and 0.8 good, and correlations of 0.8 or higher excellent [26,27]. As the SER was developed for patients after knee and hip surgery and the SES only for patients undergoing hip surgery, it can be concluded that a correlation of 0.62 can be considered moderate to good, as initially both questionnaires were not developed to measure exactly the same constructs.

A limitation of the study is that the research was executed with patients 0 to 12 months after their operation. In order to gain insight into a possible effect of recall problems, an additional factor analysis was done in which our research group was split into a group operated 0–6 months earlier and a group operated 7–12 months earlier. In the last group the same factor structure was seen as in the total group. With respect to the first group, a factor structure was seen as described by the original developers of the scale, that is, with item 5 loading on the second factor. A possible explanation for this effect can be that during the first 6 months postoperative, to restart walking (item 5) is an essential part of the rehabilitation process and is also perceived as such by the patients. After a period of 6 months postoperative, it is assumed that patients are able to perform activities of daily living again, and thus also walking in an acceptable way. However, it is still possible that patients will experience difficulty walking.

In this study the research was limited to internal consistency as an aspect of reliability and criterion and construct validity. Further research can be done into objectivity (inter-rater reliability) and stability (test-retest reliability) as aspects of questionnaire reliability. With respect to validity, additional research can be done into the predictive validity of the questionnaire [22]. In the case of this study, that will be to what extent the self-efficacy score on the SER predicts rehabilitation behaviour. Moon and Backer [8] already found in their research that after a total hip or knee arthroplasty, higher levels of patients' self-efficacy were correlated with longer distances in ambulation and with a higher frequency and more repetitions of leg exercises. Kurlowicz [18] concluded that higher levels of self-efficacy were associated with enhanced functional ability and a decrease in the likelihood of depressive symptoms after total hip replacement surgery.

4.2. Conclusion

The research into validity and reliability of the SER was done in patients 0–12 months after their hospitalisation. The results of this study show that, for that period, the questionnaire appears to be a reliable and valid measure the medical staff can use to assess self-efficacy in patients undergoing a total hip or knee arthroplasty.

4.3. Practice implications

Insight into patients' self-efficacy is relevant, as it also provides insight into their belief regarding their ability to perform behaviours typical of physical rehabilitation after a total hip or knee arthroplasty. The SER can be especially useful in the evaluation of interventions to enhance self-efficacy, which eventually should lead to improved functional outcome after a total hip or knee arthroplasty. In his social learning theory, Bandura [10] describes four sources of efficacy information that can be manipulated in interventions: (1) past and present levels of performance, (2) vicarious experience of observing others perform, (3) verbal persuasion, and (4) states of physiological arousal.

To our knowledge, however, the development of interventions in orthopaedics is still in its infancy. One of the few examples is a study by Pellino et al. [9], who conducted research into the effect of a preoperative education program for orthopaedic patients. The patients who participated in the education program experienced a significantly higher level of self-efficacy compared to patients in the control group. Another example is the Groningen Orthopedic Exit Strategy (GOES), developed at our department [28]. In this intervention, one of the goals is enhancement of self-efficacy during and after hospital stay, which eventually should lead to improved functional outcome after a total hip or knee arthroplasty. Results of this intervention study will reveal additional information with respect to the predictive validity, objectivity and stability as aspects of reliability of the Dutch version of the SER.

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