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ORIGINAL REPORT

EXERCISE SELF-EFFICACY IN PERSONS WITH SPINAL CORD INJURY: PSYCHOMETRIC PROPERTIES OF THE DUTCH TRANSLATION OF THE EXERCISE SELF-EFFICACY SCALE

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Objective: **To assess the reliability and validity of the Dutch version of the Exercise Self-Efficacy Scale (ESES) in persons with spinal cord injury. This is the first independent study of ESES psychometric properties, and the first report on ESES test–retest reliability.**

Subjects/patients: **A total of 53 Dutch persons with spinal cord injury.**

Methods: **Subjects completed the Dutch ESES twice, with 2 weeks between (ESES_1 and ESES_2). Subjects also completed the General Self-Efficacy scale (GSE), and a questionnaire regarding demographic characteristics and lesion characteristics. Psychometric properties of the Dutch translation of the ESES were assessed and compared with those of the original English-language version.**

Results: **The Dutch ESES was found to have good internal consistency (Cronbach's α for ESES_1 = 0.90, ESES_2 = 0.88). Test–retest reliability was adequate (intraclass correlation coefficient = 0.81, 95% confidence interval 0.70–0.89). For validity, a moderate, statistically significant correlation was found between ESES and the GSE (Spearman's ρ ESES_1 = 0.52, ESES_2 = 0.66, $p<0.01$). Furthermore, the psychometric properties of the Dutch ESES were found to be similar to those of the original English version.**

Conclusion: **The results of this study support the use of the ESES as a reliable and valid measure of exercise self-efficacy.**

Key words: self-efficacy; exercise; activities of daily living; questionnaires; spinal cord injury.

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INTRODUCTION

A spinal cord injury (SCI) is characterized by muscle paralysis and loss of sensation below the level of the lesion. Persons with SCI often have secondary conditions, such as bladder and bowel dysfunction, sexual dysfunction, neuropathic pain, spasticity, pressure ulcers and psychological problems (1). There is preliminary evidence that a physically active lifestyle can prevent or reduce some of these secondary conditions (2). Moreover, studies show that physical activity in persons with SCI benefits several health aspects, including physical fitness, risk of cardiovascular disease, and quality of life (2–3).

Despite these known benefits, physical activity levels in persons with SCI are generally very low (4–6). Therefore, it is important to promote physical activity among persons with SCI. Several interventions are available (7); however, the most effective way to promote physical activity in this group remains unknown. Finding the optimal intervention to achieve and maintain higher activity levels in persons with SCI requires identification of modifiable factors that correlate with changes in physical activity. Multiple factors are linked to exercise participation (8). Self-efficacy is one modifiable factor that has proven to be the most consistent correlate of physical activity behaviour in non-disabled adults (9). Self-efficacy is defined as "beliefs in one's capabilities to organize and execute the courses of action required for producing given attainments" (10). In persons with SCI, self-efficacy has been shown to be related to increased exercise, and self-efficacy is a predictor of exercise outcomes (11). Moreover, other studies suggest that self-efficacy could be a key mediating factor in the promotion of physical activity in persons with SCI (12–16).

To assess self-efficacy specific for exercise and physical activity in persons with SCI, Kroll et al. (17) developed the Exercise Self-Efficacy Scale (ESES). This scale was found by its developers to be a valid and internally consistent measure (17). To be able to use this questionnaire in Dutch persons with SCI, we translated the ESES into Dutch. The purpose of the current study was to assess the reliability and validity of the Dutch version of the ESES in persons with SCI and to compare its psychometric properties with those of the original English-language version. This is the first independent study of the psychometric properties of the ESES, and the first to report ESES test–retest reliability, which has never been assessed for the English version.

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METHODS

Participants

A convenience sample of 53 persons with SCI participated in this study between March 2011 and January 2012. Inclusion criteria were: aged 18–80 years with sufficient comprehension of Dutch to complete questionnaires. Participants were recruited from the inpatient ($n=14$) and outpatient ($n=23$) departments of Rijndam Rehabilitation Centre in Rotterdam and from the Dutch Spinal Cord Injury Association ($n=16$). This study was approved by the medical ethics committee of Erasmus Medical Center Rotterdam, The Netherlands.

Instruments

The ESES consists of 10 items about level of self-confidence with regard to performing regular physical activities and exercise (17). A sample item is: "I am confident that I can overcome barriers and challenges with regard to physical activity and exercise if I try hard enough". Respondents answer using a 4-point scale: not at all true, rarely true, sometimes true, and always true. The minimum score is 10 and the maximum score 40. A higher score indicates higher exercise self-efficacy.

Two Dutch persons with expertise in rehabilitation medicine independently translated the ESES from English to Dutch. These two translations were synthesized into a final document using consensus between the two translators and an expert committee. A professional translator then back-translated the Dutch version into English. The English translation was compared with the original English version; in consultation with the expert committee and the developers of the English questionnaire, a final Dutch version was created.

To assess validity, participants completed the Dutch version of the General Self-Efficacy Scale (GSE) (18). The GSE is commonly used to measure self-efficacy in general situations. For example: "I can always manage to solve difficult problems if I try hard enough." This scale is also a 10-item scale with 4 response categories: not at all true, hardly true, moderately true and exactly true. The minimum score is 10 and the maximum score 40. A higher score indicates higher general self-efficacy. Participants also answered a question about sports participation: whether they currently participated in sports, and if so, which sport and for how many hours per week.

Participants completed an additional questionnaire regarding demographic and spinal cord lesion characteristics. Demographic characteristics included: age, gender, country of birth, educational level and marital status. Educational categories were: low (prevocational practical education or less), medium (prevocational theoretical education and secondary education) or high (higher vocational education and university). Lesion characteristics included lesion level, motor completeness, time since injury, and cause of lesion. Tetraplegia was defined as a lesion at or above the Th1 segment, and paraplegia as a lesion below Th1.

Procedure and data analysis

Participants initially completed the ESES (ESES_1), the GSE, and the demographic and lesion characteristic questionnaire. All participants completed the ESES again (ESES_2) 2 weeks later, as recommended by Terwee et al. (19). Score distribution was assessed by calculating the mean (standard deviation; SD), median (interquartile range; IQR), skewness, and floor and ceiling effects. Skewness was present if values exceeded the range of –1 to 1 (20). Floor and ceiling effects were present if 15% or more of the participants scored either the lowest score or highest score on a scale (19). Because data were not normally distributed, non-parametric tests were used where possible. To assess reliability, internal consistency and test–retest reliability were determined. Internal consistency was determined by assessing Cronbach's α. An α of 0.70 was considered adequate (21). For test–retest reliability, the intra-class correlation coefficient (ICC) between ESES_1 and ESES_2 was determined. An ICC >0.75 was considered sufficient (21). Construct validity was assessed by correlating the ESES with the GSE. A moderate Spearman's ρ (0.30–0.70) (22) was expected because the two questionnaires measure related, but different, constructs of self-efficacy. In addition, discriminant validity was tested by comparing exercise self-efficacy scores of regular exercisers and non-exercisers. Based on the question about sports participation, participants were classified as regular exercisers (persons participating in sports at least once per week) or non-exercisers (all others). The 14 participants recruited from inpatient rehabilitation did not answer this sports participation question because all participated in daily therapy with several types of exercise. Therefore, these participants were treated as a separate group in this analysis. It was hypothesized that regular exercisers would score higher on the ESES compared with non-exercisers. A Kruskal-Wallis test was used to test for differences in exercise self-efficacy between regular exercisers, non-exercisers and participants in inpatient rehabilitation. For a Kruskal-Wallis test showing significance, *post hoc* analyses were performed using Mann-Whitney tests with Bonferroni correction (p-value $0.05/3=0.017$). Statistical analysis was performed using SPSS version 17.0.

RESULTS

Score distribution

Participants characteristics are shown in Table I. Descriptive statistics for ESES and GSE are shown in Table II. Both the ESES_1 and ESES_2 scores were negatively skewed. No floor or ceiling effects were noted.

Reliability

Cronbach's α was 0.90 for ESES_1 and 0.88 for ESES_2, indicating good internal consistency. Furthermore, the ICC between ESES_1 and ESES_2 was 0.81 (95% CI 0.70–0.89), indicating adequate test–retest reliability.

Table I. *Participants characteristics (*n = 53*)*

Age, years, mean (SD)	51.5 (12.3)
Gender, *n* (%)	
Men	44 (83)
Women	9 (17)
Country of birth, *n* (%)	
The Netherlands	48 (91)
Other	5 (9)
Education, *n* (%)	
Low	14 (26)
Medium	25 (47)
High	14 (26)
Current marital status, *n* (%)	
Married/living together	31 (58)
Other	22 (42)
Lesion level, *n* (%)	
Paraplegic	33 (62)
Tetraplegic	20 (38)
Completeness, *n* (%)	
Complete	34 (64)
Incomplete	19 (36)
Time since injury, months, mean (SD) [range]	107.2 (122.3) [2–513]
Cause of lesion, *n* (%)	
Traumatic	40 (75)
Non-traumatic	13 (25)

SD: standard deviation.

Table II. *Descriptive statistics of the Exercise Self-Efficacy Scale (ESES) and General Self-Efficacy Scale (GSE) (n = 53)*

	Mean (SD)	Median (IQR)	Skewness	Floor, % score = 10	Ceiling, % score = 40
ESES_1	33.1 (5.6)	34.0 (30.5–37.0)	–1.64	1.9	9.4
ESES_2	33.6 (5.0)	35.0 (31.0–37.0)	–1.38	0	11.3
GSE	33.7 (4.4)	34.0 (30.5–37.0)	–0.46	0	7.5

ESES_1: first completion; ESES_2: second completion, 2 weeks later.
SD: standard deviation; IQR: interquartile range.

Validity

With respect to construct validity, a correlation of $\rho = 0.52$ ($p < 0.01$) was found between ESES_1 and GSE, and $\rho = 0.66$ ($p < 0.01$) between ESES_2 and GSE. Validity was also tested by comparing exercise self-efficacy of regular exercisers, non-exercisers, and participants in inpatient rehabilitation. Median ESES and GSE scores for the 3 groups are shown in Table III. The Kruskal-Wallis test showed a significant group effect for ESES_1 (χ^2=6.68, $p = 0.035$). *Post hoc* analysis showed a significant difference between the participants in inpatient rehabilitation and non-exercisers (U = 61.00, $p = 0.013$). A non-significant difference was found between regular exercisers and non-exercisers (U = 119.50, $p = 0.050$). Regular exercisers and participants in inpatient rehabilitation had comparable scores (U = 135.50, $p = 0.697$). The Kruskal-Wallis test showed no significant group effect for ESES_2 (χ^2= 1.89, $p = 0.389$) or GSE (χ^2= 0.22, $p = 0.898$).

DISCUSSION

This study shows that the Dutch translation of the ESES is a valid and reliable measure of exercise self-efficacy in persons with SCI. This is the first study to assess ESES test–retest reliability, which was found to be adequate. Also, internal consistency was good and comparable to that reported by Kroll et al. (17) (Cronbach's $\alpha = 0.87$).

The moderate correlation between the ESES and GSE implies that both questionnaires measure related, but different, constructs of self-efficacy. The correlation between ESES and GSE ($\rho = 0.52$ for ESES_1 and 0.66 for ESES_2) found in the current study was higher than the correlation ($\rho = 0.32$) found by Kroll et al. (17) for the English-language version, who also used the GSE as a reference measure. We do not have an explanation for this difference in validity found between the Dutch and English versions.

Table III. *Median Exercise Self-Efficacy Scale (ESES) and General Self-Efficacy Scale (GSE) scores for regular exercisers, non-exercisers and participants in inpatient rehabilitation*

	Regular exerciser (*n* = 21) Median (IQR)	Non-exerciser (*n* = 18) Median (IQR)	Inpatient rehabilitation (*n* = 14) Median (IQR)
ESES_1*	35.0 (31.0–38.0)	30.5 (27.5–35.0)	35.0 (34.0–36.25)
ESES_2	35.0 (31.0–37.0)	32.0 (28.0–37.25)	35.0 (31.0–38.0)
GSE	34.0 (30.5–37.0)	33.5 (29.0–38.0)	33.0 (31.0–38.25)

*ESES_1 showed a significant group effect ($p = 0.035$), with a significant difference between non-exercisers and participants in inpatient rehabilitation ($p = 0.013$). There was a non-significant difference between regular exercisers and non-exercisers ($p = 0.05$).
IQR: interquartile range.

The inpatient rehabilitation participants in our study had significantly higher exercise self-efficacy compared with non-exercisers. Exercise self-efficacy of inpatient rehabilitation participants was comparable to the exercise self-efficacy of regular exercisers. This implies that persons in inpatient rehabilitation are as confident about physical activity and exercise as regular exercisers. Because persons enrolled in inpatient rehabilitation programmes are engaged in daily therapy including a relatively large amount of exercise and physical activity, they can be considered regular exercisers. That persons in inpatient rehabilitation are relatively physically active is supported by a study by van den Berg-Emons et al. (5), which showed that physical activity levels during inpatient rehabilitation are low, but significantly higher compared with physical activity levels following discharge.

Regular exercisers showed higher median ESES scores (35 for ESES_1 and 35 for ESES_2) compared with non-exercisers (30.5 for ESES_1 and 32 for ESES_2). However, this difference in exercise self-efficacy between regular exercisers and non-exercisers was not statistically significant. This not statistically significant difference could be explained by the relatively large range in the group of regular exercisers compared with the smaller range among participants in inpatient rehabilitation, for whom we did find a significant difference with the non-exercise group. Although the regular exerciser group was larger ($n = 21$) than the inpatient rehabilitation group ($n = 14$), all study groups were small and it is likely that low power accounted for the lack of significant difference. Both Kroll et al. (17) and Stroud et al. (23) reported that regular exercisers scored significantly higher on the ESES compared with non-exercisers.

No ceiling effects were found for the ESES, but scores were negatively skewed, indicating that participants frequently had high scores. Our mean scores (33.1 for ESES_1 and 33.6 for ESES_2) were higher compared with mean ESES scores reported in previous studies. Kroll et al. (17) reported a mean score of 31.8 (SD 8.8) in persons with SCI and Stroud et al. (23) reported a mean score of 28.8 (SD 5) in persons with multiple sclerosis. Our higher mean score could have resulted from our recruitment venues: inpatient rehabilitation, outpatient rehabilitation, and via the Dutch Spinal Cord Injury Association. Approximately half of the participants recruited from outpatient rehabilitation and via the Dutch Spinal Cord Injury Association were regular exercisers with high ESES scores. The participants in inpatient rehabilitation also scored high on ESES. Therefore, we had a relatively large number of participants with high scores, leading to a negative skew. It is important when interpreting ESES to consider the high scores of persons with SCI in inpatient rehabilitation. Furthermore, our results imply that a focus on exercise self-efficacy may be of little value during inpatient rehabilitation. However, it may be of added value to focus on expectations about exercise self-efficacy after discharge from the rehabilitation centre. Longitudinal studies are needed to verify these hypotheses.

In addition to participant recruitment, participant characteristics could also affect scores. Although sample characteristics were comparable to those reported in previous Dutch studies (24), our sample consisted of more males (83% vs 60% and 18%) compared with two other studies using the ESES (17, 23). Whereas a previous study showed that boys had significantly higher self-efficacy compared with girls (25), we found no such difference in exercise self-efficacy between men and women ($U=167$, $p=0.46$).

Although this study met criteria for psychometric studies (19), there are some limitations. First, group sizes to compare scores of regular exercisers, non-exercisers and participants in inpatient rehabilitation were small. Nevertheless, we found some significant between-group differences. Furthermore, allocation to the group of regular exercisers or non-exercisers was based on only one question about sports participation. In addition, non-participation in sports does not mean that someone is physically inactive.

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