The Physical Activity Scale for Individuals with Physical Disabilities: Test-Retest Reliability and Comparison With an Accelerometer

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Background: The objective was to determine the test-retest reliability and criterion validity of the Physical Activity Scale for Individuals with Physical Disabilities (PASIPD). *Methods:* Forty-five non-wheelchair dependent subjects were recruited from three Dutch rehabilitation centers. Subjects' diagnoses were: stroke, spinal cord injury, whiplash, and neurological-, orthopedic- or back disorders. The PASIPD is a 7-d recall physical activity questionnaire that was completed twice, 1 wk apart. During this week, physical activity was also measured with an Actigraph accelerometer. *Results:* The test-retest reliability Spearman correlation of the PASIPD was 0.77. The criterion validity Spearman correlation was 0.30 when compared to the accelerometer. *Conclusions:* The PASIPD had test-retest reliability and criterion validity that is comparable to well established self-report physical activity questionnaires from the general population.

Key Words: rehabilitation, physical activity, questionnaire, validity, test-retest reliability

A sufficiently physically active lifestyle would be beneficial for individuals with a physical disability, who are on average even more sedentary than people in the general population.[1] There is a need for a reliable and valid measure of physical activity for research in this specific population. Physical activity recall questionnaires are the most common and practical measures of physical activity in large population studies, because they are valid, reliable, easy, low-cost methods that

do not alter the subjects' behavior.[2] The Physical Activity Scale for Individuals with Physical Disabilities (PASIPD) was developed because no specific questionnaire existed for this population.[3] Since only data on the internal consistency and construct validity of the PASIPD have been reported,[3] the objective of this study was to determine the test-retest reliability and criterion validity of the PASIPD in people with a physical disability.

Methods

Study Subjects

Forty-five adult patients or former patients (last 2 y) of three Dutch rehabilitation centers were recruited. Patients were included if the following criteria were met: 1) diagnosis was stroke, spinal cord injury, whiplash, neurological-, orthopedic- or back disorders; 2) sufficient cognitive abilities; 3) no medical contraindications; 4) no terminal/progressive disease; 5) sufficient understanding of the Dutch language; 6) non-wheelchair dependent. Participants gave written informed consent and the study was approved by the Medical Ethics Committee of Rehabilitation Centre Het Roessingh in Enschede, the Netherlands.

Instruments and Procedure

The PASIPD is a 7-d recall physical activity questionnaire for individuals with physical disabilities. It records the number of days per week and hours per day for participation in leisure time, household, and occupational physical activities over the past 7 d. The PASIPD was translated into Dutch, and questions 10 (lawn work or yard care) and 11 (outdoor gardening) of the original questionnaire were integrated into a single question, since this better represented the Dutch situation. This made the Dutch PASIPD a 12-item questionnaire, from which a total physical activity score was calculated as the average hours daily multiplied by a metabolic equivalent value and summed over items.[3]

The Actigraph accelerometer model 7164 (ActiGraph LLC, Fort Walton Beach, FL) is a small ($51 \times 41 \times 15$ mm), lightweight (43 g) uniaxial accelerometer and was worn on the right hip. The Actigraph has a frequency response of 0.25 to 2.5 Hz, and detects vertical accelerations ranging from 0.05 to 2 G, which are converted into activity counts per minute. The Actigraph registered activity counts during the 7-d period that was recalled in the PASIPD.

Subjects completed a first PASIPD and started wearing the Actigraph for seven full days, except during sleep and water activities. After these 7 d the PASIPD was completed a second time.

Statistical Analyses

Data analyses followed a pre-established analysis plan, using SPSS 11.0 software (SPSS, Inc., Chicago, IL). Since PASIPD data were not normally distributed, a nonparametric Spearman correlation coefficient was calculated between the second and first PASIPD. For the criterion validity, a nonparametric Spearman correlation was calculated for the second PASIPD and the Actigraph.

Results

Table 1 shows demographic data of the 45 subjects. Nine subjects received treatment at the participating rehabilitation centers, the remainder finished rehabilitation in the previous 2 y. Because the first PASIPD was added to the study at a later stage, 13 subjects did not complete it. Due to logistic problems some Actigraph ($n = 2$) and first PASIPD ($n = 4$) data were missing.

Table 2 shows the values and correlations of the outcomes. The mean difference between the first and second PASIPD (Δ PASIPD) was -14.2 KJ $\cdot$ kg^{-1} $\cdot$ d^{-1} (95% CI: -69.9 to 41.5), and the test-retest reliability Spearman correlation was 0.77. The criterion validity Spearman correlation comparing the PASIPD and Actigraph was 0.30.

Table 1   Demographic Data of the Participants ($n = 45$)

Variable	Value
Gender female [n (%)]	27 (60)
Mean age ± SD (y)	47 ± 12
Mean body-mass index ± SD (kg/m^2)	25.0 ± 3.9
Diagnosis [n (%)]	
Stroke	13 (29)
Neurological disorders	4 (9)
Orthopedic disorders	4 (9)
Spinal cord injury	1 (2)
Back disorders	12 (27)
Chronic pain	7 (15)
Whiplash	3 (7)
Unknown	1 (2)

Table 2   Values and Correlations of the PASIPD and Actigraph

Outcome	n	Mean ± SD	95% CI	Spearman correlation with second PASIPD
First PASIPD (KJ $\cdot$ kg^{-1} $\cdot$ d^{-1})	28	74.9 ± 58.8		0.77*
Second PASIPD (KJ $\cdot$ kg^{-1} $\cdot$ d^{-1})	45	65.1 ± 44.6		
Δ PASIPD (KJ $\cdot$ kg^{-1} $\cdot$ d^{-1})	28	-14.2 ± 28.4	-69.9 to 41.5	
Actigraph (Kcounts/wk)	43	1380 ± 738		0.30*

*$P < 0.05$

Discussion

The reported test-retest reliability correlation of 0.77 reflects both measurement error of the PASIPD and true variation in physical activity between the two recall weeks. This reliability is comparable to other physical activity questionnaires; a review of self-report physical activity measures in the general population reported correlations from 0.34 to 0.89 (median approximately 0.80).[2] The International Physical Activity Questionnaire (IPAQ), which was developed in an attempt to standardize physical activity measurement, showed a reliability correlation of approximately 0.80.[4] The only other questionnaire for individuals with disabilities to date, the Physical Activity and Disability Survey had a reliability correlation of 0.85 in African American overweight women with stroke or diabetes.[5]

The reported criterion validity correlation of the PASIPD (0.30) was similar to that of physical activity questionnaires for the general population. A review reported correlations between questionnaires and accelerometers from 0.14 to 0.53 (median approximately 0.30).[2] The IPAQ reported a correlation of approximately 0.30 with the Actigraph.[4] Studies among people with COPD and multiple sclerosis reported correlations between questionnaires and accelerometers of 0.14 and 0.32, respectively.[6,7] In a subsample of the current study in which subjects also wore a RT3 accelerometer ($n = 22$), a 0.23 correlation with the PASIPD was found.

Although the Actigraph was used as the criterion for the validation of the PASIPD, both methods have limitations and are not "gold standards" for the measurement of physical activity. Questionnaires have social desirability and recall bias, while accelerometers have problems with sensitivity to certain movements and wearing compliance.[2,8] But because the PASIPD and Actigraph measure physical activity in a different way, with different kinds of bias, this is an interesting comparison, although a better validation would be to compare the PASIPD to doubly labeled water, which is the gold standard for 24 h energy expenditure. However, using doubly labled water is complex and expensive, and its validity could be lower in individuals with health conditions that affect total body water content.[3]

For populations with abnormal gait patterns not much is known concerning the validity of accelerometers.[3] However, a study in adults with acquired brain injury and related gait impairments has suggested that the Actigraph provides a valid index of activity across different walking intensities.[9] Since the current study population was quite ambulatory and no subjects had extreme gait impairments, it seems unlikely the Actigraph produced inaccurate results.

The reported reliability and validity of the PASIPD can only be generalized to ambulatory and sufficiently cognitive able populations with physical disabilities. Future studies are needed to study the PASIPD for wheelchair-dependent individuals and people who have more psychological-related diagnoses. The current study lacked the statistical power to determine if the reliability and validity of the PASIPD differed between people with different diagnoses.

Conclusion

This study showed that the PASIPD had test-retest reliability and criterion validity comparable to well established self-report physical activity questionnaires from

the general population. Although more research is needed to obtain better insights in the validity and applicability of the PASIPD, it can be used to monitor physical activity in individuals with physical disabilities.

Acknowledgments

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