Assessing Sit-to-Stand for Clinical Use

Lummel, R.C.

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SUMMARY

Growing life expectancy is one of the blessings of modern healthcare, but is associated with a gradual loss of mobility, which may lead to a loss of independence in everyday life. As argued in the Introduction (Chapter 1), a prerequisite for independent mobility is the ability to stand up from a seated position, which is therefore used in the clinic as an index of motor functioning. Hence, the Sit-to-Stand (STS) transition formed the main focus of the investigations reported in this thesis. In particular, the main aims of these investigations were threefold: (1) to develop a clinically applicable method to measure and analyze sit-to-stand movements, (2) to demonstrate and explore the clinical relevance of this method, and (3) to analyze associations between physical performance and daily-life physical activity. These main aims were addressed in the three content parts (Part I-III) of the thesis.

The work in Part I started with the introduction of a new automated method for quantifying the repeated STS movements using a single body-fixed sensor located at the waist (Chapter 2), the instrumented STS or iSTS. The validity of this method in quantifying the seat-off and seat-on durations of STS movements was established in young and older adults, using switches underneath the chair for reference (Chapter 3). In a related side project, the intra-rater, inter-rater and test-retest reliability of the instrumented Timed-Up-and-Go (iTUG) were determined in patients with Parkinson's disease (PD) (Chapter 4). Collectively, these results demonstrated the usability, validity and reliability of instrumented (i.e., single sensor-based) and automated assessments of (repeated) STS and TUG.

After having established the feasibility of the developed methodology, its clinical relevance was examined in Part II. In Chapter 5 it was found that the durations of repeated iSTS sub-phases have stronger associations with health status, functional status and daily physical activity in older adults than manually recorded test durations. Subsequently, it was shown in Chapter 6 that kinematic features of repeated iSTS are associated with handgrip strength in older adults, suggesting that trunk use becomes more dynamic with low muscle strength. Finally, in Chapter 7 a new method was developed for scoring STS performance in older adults in a clinical context. These results highlighted the potential of iSTS for clinical use.

The study in Part III focused on the relationship between physical performance (PP) and physical activity (PA). It was found that better STS performance is associated with shorter sitting durations and more frequent break-ups between sitting episodes, both of which are characteristics of an active, independent lifestyle (Chapter 8). Nevertheless, it was found that PP and PA constitute separate domains of physical function, with PA classes providing more information than overall PA. This finding has both theoretical and practical relevance since it underscores that "what you can do" should not be equated with "what you do do".