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# Validity and reliability of a video questionnaire to assess physical function in older adults

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ABSTRACT

*Background:* Self-report questionnaires are widely used to assess physical function in older adults. However, they often lack a clear frame of reference and hence interpreting and rating task difficulty levels can be problematic for the responder. Consequently, the usefulness of traditional self-report questionnaires for assessing higher-level functioning is limited. Video-based questionnaires can overcome some of these limitations by offering a clear and objective visual reference for the performance level against which the subject is to compare his or her perceived capacity. Hence the purpose of the study was to develop and validate a novel, video-based questionnaire to assess physical function in older adults independently living in the community.
*Methods:* A total of 61 community-living adults, 60 years or older, were recruited. To examine validity, 35 of the subjects completed the video questionnaire, two types of physical performance tests: a test of instrumental activity of daily living (IADL) included in the Short Physical Functional Performance battery (PFP-10), and a composite of 3 performance tests (30 s chair stand, single-leg balance and usual gait speed). To ascertain reliability, two-week test-retest reliability was assessed in the remaining 26 subjects who did not participate in validity testing.
*Results:* The video questionnaire showed a moderate correlation with the IADLs (Spearman rho = 0.64, $p < 0.001$; 95% CI (0.4, 0.8)), and a lower correlation with the composite score of physical performance tests (Spearman rho = 0.49, $p < 0.01$; 95% CI (0.18, 0.7)). The test-retest assessment yielded an intra-class correlation (ICC) of 0.87 ($p < 0.001$; 95% CI (0.70, 0.94)) and a Cronbach's alpha of 0.89 demonstrating good reliability and internal consistency.
*Conclusions:* Our results show that the video questionnaire developed to evaluate physical function in community-living older adults is a valid and reliable assessment tool; however, further validation is needed for definitive conclusions.

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## 1. Introduction

Persons 65 years or older represent the fastest growing age group in the United States (Werner, 2010). It is estimated that by 2050 there will be 83.7 million older adults, almost double the estimated population of 43.1 million in 2012 (Vincent and Velkoff, 2010). It is well-established that aging results in a progressive decline in skeletal muscle mass and strength (Frontera et al., 2008; Gallagher et al., 2000). This age-related loss of muscle and strength can gradually lead to the loss of physical independence, increased fall probability, and reduced quality of life in older persons (Janssen et al., 2004; Lord et al., 1994).Maintaining function and independence is equally as important as prolonging life expectancy in older adults (Katz et al., 1983). Considering the expected rise in elderly population, preserving or maintaining physical function poses a significant public health concern. In recognition of the problem, one of the objectives proposed by the United States Department of Health And Human Service's Healthy People 2020 initiative is to reduce the proportion of older adults with moderate to severe functional limitations (United States Department of Health and Human Services (HHS), Healthy People 2020. Washington, DC.). Therefore, developing valid and practical instruments to assess physical function in the clinic, or to evaluate the effectiveness of interventions designed to improve function, is a critically important topic in the field of aging.

Assessment of physical function employs two basic approaches: self-report (or proxy) and performance measures (Guralnik et al., 1994; Haywood et al., 2006). Both are complementary, yet distinct, constructs and have inherent advantages and disadvantages (Hoeymans et al., 1996). Unlike self-reports, performance measures are less influenced by ceiling effects, cognitive impairments, education, culture, and language (Guralnik et al., 1989). Hence performance measures are often preferred, whether separately or in concert with self-reported measure (Brach et al., 2002; Guralnik et al., 1994; Kivinen et al., 1998). Although a

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limited number of studies in certain sub-groups have shown self-report to be as sensitive as performance based tests, performance tests are generally regarded to be more sensitive to change (Fried et al., 2000; Fritz and Piva, 2003). Although the benefits of performance testing are clearly defined, their use when assessing physical function is limited due to feasibility issues including space requirements, special equipment, trained personnel, physical and temporal burdens placed upon the subject, injury potential, the willingness of the subject to exert necessary effort, and the assessment time and cost to the testing facility. Owing to these drawbacks, self-reported measures are widely used to evaluate physical function in clinical settings and large scale studies. One of the major limitations of self-reported measures, however, is the lack of a strict definition or frame of reference to the questions. For example, a self-reported assessment of stair climbing could be interpreted differently by people with similar functional and cognitive abilities. The responses could differ based on the perceived architectural characteristics of the stairs to which they are accustomed, such as the inclination, height and depth of the steps, presence or absence of a hand rail, and the number of steps. In addition, without a clear objective reference for self-comparison, interpretation of difficulty levels tend to be problematic during self-reports. Hence, most traditional self-report measures are limited to measuring inability, need for assistance or difficulty when performing a task, rather than higher level of functioning in independently-living individuals (Guralnik and Simonsick, 1993).

Video questionnaires, which provide a clear frame of reference, can overcome some of the drawbacks inherent in self-reported questionnaires of physical function. Also, since there is an objective reference against which questions can be prepared, subjects could have fewer problems interpreting the difficulty levels. For instance, a video clip of a person climbing stairs can clearly show the task required and also the architectural characteristics of the stairs. Also, how fast the person in the video climbs the stairs can serve as a consistent visual reference for the performance level against which the subject is to compare his or her perceived capacity. Further, given the rapid advances in the field of tablets - handheld touch-screen computers with wireless connectivity - the delivery, usability, and cost of video questionnaires poses little problem. Considering the availability of the technology, the advantages of video presentation for self-reporting, and the lack of studies looking at the effectiveness of video questionnaires to assess function, this constitutes a promising area for aging research.

To our knowledge, only two video questionnaires have been investigated: the Animated Activated Questionnaire (AAQ) for assessing basic activity of daily living (BADL's) in patients with hip/knee osteoarthritis (OA) and the Mobility Assessment Tool (MAT-sf) to assess mobility limitations in a moderately functional elderly cohort (Rejeski et al., 2010). Unlike mobility, instrumental activities of daily living (IADLs) constitute complex tasks necessary for functioning independently in the community such as doing laundry, carrying groceries, climbing stairs, and dressing (Lawton and Brody, 1969).

Considering that the IADLs involve complex and strenuous physical tasks, they usually demonstrate substantial declines before decreases in BADLs become evident. Therefore, assessing IADLs can help identify individuals who are at high risk of disability, but who otherwise appear independent and report little disability. Also, since IADLs directly reflect tasks associated with daily living, they may better assess disability than physical performance tests. On the other hand, physical performance tests such as the chair stand, single-leg balance, and gait speed, reflect measures closer to the concept of impairment or functional limitation (Hoeymans et al., 1996). These considerations should be taken into account when constructing assessment tools designed to allow targeted activity-based interventions, since individuals' exercise responses are specific to the nature of the overload, and persons having higher functional status or moderate frailty tend to benefit the most from these interventions (Gill et al., 2002).

In light of the importance of assessing physical functioning in older adults and the benefits of using a video questionnaire as a mode of self-reporting, we propose a new video assessment tool to evaluate IADLs in independently living older individuals. Therefore, the aim of the current study was to develop and validate a computer-administered video questionnaire to assess IADLs in healthy, older adults. Our primary hypothesis was that the video questionnaire would exhibit a moderate correlation with the actual performance of the IADLs. Additionally, we hypothesized that the video questionnaire would have lower correlations with physical performance tests which measure impairment rather than activities of daily living (IADLs).

## 2. Material and methods

### *2.1. Item selection and questionnaire development*

The questionnaire was designed to evaluate IADL performance in community-dwelling older adults. For item development, we used items from a pre-existing physical function performance measure, the Physical Functional Performance 10 Test (PFP-10). The PFP-10 has been shown to be valid, reliable and sensitive to change in ambulatory adults over 60 years of age (Cress et al., 1996, 1999, 2005). The PFP-10 measures the ability to perform 10 IADLs making it a measure of daily function rather than physical performance. Also, the PFP-10 was specifically designed to minimize ceiling or basement effects and uses several physical domains (upper or lower body strength, flexibility, balance, coordination and endurance). Items in the PFP-10 were selected based on theory, expert opinion, focus groups, and feasibility criteria (Cress et al., 2005).

Ten videos of IADLs included in the PFP-10 were recorded. To minimize any ceiling effect, the videos were recorded using young healthy adults, both male and female, who were instructed to perform the task as fast as possible. The videos were edited and rendered using a video editing software package (Adobe Premiere PrO CS5, San Jose). The videos were then interfaced using an online questionnaire (Qualtrics, Provo, UT). The participant could repeat the videos as many times as they wished, responding by moving a slider along a visual analog scale ranging from 0–100 so they could edit answers as they felt appropriate. All questions had to be answered to complete the questionnaire successfully. A snapshot of the video questionnaire with the visual scale and navigation elements is shown in Fig. 2.

All video items were accompanied by a task question. The questions were framed in the present tense using a capability (can do) stem rather than a performance stem (does do), like “can you do the task” as opposed to “are you able to”. For example, the floor rise video was accompanied by the question, “can you sit down and get up from the floor as fast as the person in the video?” Additionally, rather than using a typical 4 or 5 point rating scale, a visual analog scale ranging from 0–100 was used. The visual analog scale was divided into three cut-off points: cannot do the task (0), can do the task as fast the person in the video (50), can do faster than the person in the video (100). The questionnaire was scored by simply adding the individual item scores. The difficulty in performing the task was assessed by the individual's perception of the time he or she would require to complete a task relative to the performer in the video. Therefore, people who considered themselves to have the greatest difficulty in performing tasks, and therefore requiring the longest perceived time to complete that task, were expected to choose lower scores, while those with lower perceived time requirements and difficulty levels should choose a higher score. The clarity, comprehension, and usability of the scale were assessed qualitatively using 15 subjects similar in age and function. Revisions were made to the online survey based on their feedback. For example, font size, video size, visual slider length and navigation elements were enlarged to enhance usability.

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