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Development and preliminary validation of a new scale to assess functional ability of older population in India

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ABSTRACT

Identifying the decline in functional ability and preventing disability is the critical element of the quality of life of an old age. However, the lack of contextual scale to assess the decline in functional capacity is a major issue. Objective of this study is to design the functional ability assessment scale for elderly people in India and test its psychometric properties. Random sample of 659 individuals above 60 years of age from western part of India was recruited. This paper outlines the construction, reliability and validity of a newly developed 14 item scale named as Pune-Functional Ability Assessment Tool (Pune-FAAT). The factors were extracted using the principal component analysis. Two-factor-structure of scale was accepted after applying the K1 rule, scree plot and parallel analysis method. The two factor structure yielded variance of 64.4%. The psychometric properties of the scale were examined using confirmatory factor analysis. The scale has an excellent reliability (Cronbach's α 0.928) and very good test–retest reliability ($r = 0.884$). Each subscale demonstrated good internal consistency (Subscale I – Cronbach's α 0.938 and Subscale II – Cronbach's α 0.762). Excellent convergent validity with Standford's health assessment questionnaire ($r = 0.959$). Discriminant validity was very good as FAAT index showed significant difference in young adults (mean $\pm$ SD 1.11 $\pm$ 0.24) and older adults (mean $\pm$ SD 1.69 $\pm$ 0.70). This new measure is a potentially valuable research tool for investigating older adult's functional ability to perform basic and complex daily activities.

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1. Introduction

Functional ability means ability to cope with daily-life activities, in a broader sense it indicates health status or quality of life (Wang, 2004; Bowling, 2005). Changes in functional ability are noticeable as age advances (Badiger, Kamath, & Ashalatha, 2010). Disability in old age leads to functional dependence and associated deterioration in health and quality of life (Paterson & Warburton, 2010). Morbidity has significant influence on older individual's physical functioning and over all well-being. Impairment and disabilities are associated with increased need for social and health care services (Fried & Bush, 1988), as well as hospitalization (Courtney et al., 2011). For last two decades or more, a growing body of research has addressed various concerns namely; measurement of disability (Avlund, Kreiner, & Schultz-Larsen, 1996), predictors of disability, (McCusker, Kakuma, & Abrahamowicz, 2002) consequences of disability, and potential preventive interventions (Guralnik, Fried, & Salive, 1996). However,

quantifying limitations in daily activities or functional ability of older adults staying in community setting happens infrequently. (Abas, Punpuing, Jirapramupitak, Tangchonlatip, & Leese, 2009; Nascimento et al., 2012; Vass, Avlund, Lauridsen, & Hendriksen, 2005).

India is the second largest country in the Asian continent and faces challenge of population aging, increase in the number of people aged 60 and over. The growth of population above 60 years is expected to be to 12.4 percent by the year 2026 from 7.4 percent in year 2001. Average expectancy of life at age 60 is about 17 years (16.7 for males, 18.9 for females) and that at age 70 is around 12 years (10.9 for males and 12.4 for females) in India (CS Office GOI, 2011). Meaning thereby, a large number of elderly will live a longer life. Demand for preventive, promotive and curative care and rehabilitative services will increase phenomenally and will have a significant impact on resource allocation in public health system. Therefore research on various aspects of quality of life of elderly would be the first and most appropriate step for their welfare. One such area of importance is disability. Decline in functional capacity of fourth segment of the population will soon become a public health problem. Functional ability in daily activities can serve as a significant indicator of quality of life of old population in India. (Jotheeswaran, Joseph, & Prince, 2010)

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In this research, an attempt is made to construct and validate a tool, which measures the declining functional performance with regards to basic and instrumental activities of daily living. Investigators have initially attempted to adapt already existing tools; Katz's index (Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963), Lawton and Brody's scale (1969), Barthel index (Collin, Wade, Davies, & Horne, 1988). Health assessment questionnaire (HAQ 20), Fries, Spitz, Kraines, & Holman (1980) assesses a patient's level of functional ability and includes questions of fine movements of the upper extremity, locomotors activities of the lower extremity, and activities that involve both upper and lower extremities. There are 20 questions in eight categories of functioning, which represent a comprehensive set of functional activities (Bruce & Fries, 2003). Researcher experienced limitations while using this and other instruments in India as most of the tools have been developed in the Western countries. As a result, researchers have attempted to develop a tool and validate it to get reliable estimates of the burden of declining functional performance and identify the specific areas (activity domains) where intervention is necessary.

2. Methods

2.1. Organization of the study and participants

A cross-sectional study conducted for the period of two years between year 2010 and 2012 among individuals aged 60 and older. The study was carried out in a Pune district of the state of Maharashtra located in Western parts of India. Validation of a tool was carried out using a random sample of 659 individuals above 60 years of age. These individuals were selected from a list of participants in a longitudinal study of the department, entitled 'predictors of functional ability among elderly' which was being conducted among random sample of 1890 individuals above 60 years of age. Sample in the original study was drawn using probability proportional to size (PPS) in a multistage sampling design. The tool was administered to a subsample (659) for determining reliability and validating the structure of the scale. Sixty six participants were subjected to a retest between 6 and 8 weeks after an initial visit. Seventy individuals in the age group of 40–55 years were randomly selected and assessed using the same tool for Discriminant validity. Sixty four respondents participated in convergent validity study and filled in Health Assessment Questionnaire along with the new tool. The study was approved by the University of Pune's Ethics Committee, India. A written informed consent was obtained from all participants prior to the data collection.

2.2. Administration of the tool

Rigorous, standardized protocols were followed while administrating the questionnaire. The questionnaire was divided into three sections; demographic information, health and disease history and functional ability assessment tool. The filled in schedules were reviewed periodically for completeness, ambiguities, or inconsistencies in order to maintain the quality of the data. In case of an incomplete data, the participants were approached again. The Functional ability was scored according to the respondent's current level of ability without use of any aid. The same procedure was followed for the retest interviews. All the interviews were conducted in a local language and were preceded by filling up informed consent form.

2.3. Statistical analysis

Structure of a tool was determined by extracting factors using principal component analysis (PCA) and confirmatory factor analysis (CFA). KMO test for sampling adequacy and Bartlett's test of sphericity was conducted to check weather sample is adequate and suitable for factor analysis. After first cycle of PCA with 15 variables, the variables with communalities above 0.4 were retained for further analysis (Costello & Osborne, 2005). The number of factors to be retained was determined by applying three different criteria; Kaiser criterion (K1), scree plot and parallel analysis (PA). Factors with Eigen value greater than 1 were retained as per K1 criteria (Hayton, Allen, & Scarpello, 2004). In this study two factors fulfill the criteria of Eigen value greater than 1; first factor with eleven items and the second with three items. Cattell's scree plot method was used for further verification of number of factors that resulted in a two factor solution. Hence, a sophisticated method of parallel analysis was conducted as per the procedure described by Hayton and colleagues (2004). Structure of the scale was finalized using CFA. The scale is henceforth referred to as Pune-FAAT.

Reliability analysis was carried out on the final scale and subscales individually. The test retest reliability and convergent validity of Pune-FAAT against Health Assessment Questionnaire (HAQ) was examined using Spearman's rank correlation coefficient. HAQ has been developed by Stanford University. HAQ has been used in several studies to predict changes in functional status and normal aging (Fries et al., 1980). Discriminant validity was determined using mean index scores and compared using independent 't' test. The analysis was carried out using SPSS version 19.

3. Results

3.1. Initial design of the scale

A six member team comprised of experts in the field of gerontology, social science, psychiatry, and medicine discussed daily activities, which are necessary to lead an independent life in a community. A focus group involving twelve men and women, aged sixty and above was conducted to discuss their daily life activities. The discussion yielded list of 22 commonly performed activities. During the second meeting the group revisited the list, and based on the frequency of activities 15 were finalized. These included 11 daily living and four instrumental activities. A set of eleven activities was comprised of Lifting (weight up to 1–2 kg), bending, squatting, walking (up to 1 km at a time), climbing (1–2 flights of stairs), arising (from bed or chair), handgrip, self cleaning (bathing, shaving,) toilet use, dressing, eating. The instrumental activities were household work (cooking, cleaning, etc.), outside work (shopping), use of public transport and participation in the social gatherings. Each activity was scored from 1 to 4 based on the level of difficulty in performance without the use of any physical aid. Score of 1 was used for 'without any difficulty', 2 for 'with some difficulty', 3 for 'with most difficulty', and 4 for 'cannot do it'. Score was not computed when the respondents provided answers to less than one third of the items. An index score for each activity was then calculated by summing the scores for each activity and dividing it by the total number of activities answered. The present study includes the scores acquired without use of any assistive device to understand their underlying disability. Average time required for completion of the questionnaire was about 20 min while the time required for administering FAAT was 6–8 min. None of the participants reported difficulties in understanding the instructions or items included, as participants in the study were able to answer all questions.

3.2. Structure of the scale

Principal component analysis revealed a two factor structure, with factors corresponding to (1) eleven items pertaining to the