

Validity and Reliability of Gujarati Version of Fullerton Advanced Balance (FAB) Scale

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Abstract: *One of the leading health concerns for the elderly people is falling which is related to health problem and often hampers independency. Fullerton test is mainly intended to identify highly active older adults who are at increased risk to experience fall. Test uses both dynamic and static balance under different situations to identify balance deficits in elderly. The aim of the study was to findout test retest reliability & face validity of Gujarati version of FAB. A total of 50 elderly individuals were participated in this study (F=32, M=18). The "forward-Backward" procedure was applied for translation. Content validity was calculated by agreement of experts. Test-retest reliability of FAB was calculated by comparing test scores in 1st & 2nd evaluation (at 24 hrs of interval). Test-retest reliability of scale was assessed by ICC (.973), suggests excellent reliability and Internal consistency was assessed by using Cronbach's alpha (.985) for 1st and (.981) for the 2nd. Pearson test was use to analyzed the validity of the FAB. Pearson Correlation Coefficient (0.973). This study concluded that the Gujarati version of FAB is reliable and valid tool for measuring balance in Gujarati elderly population.*

Keywords: Validity, Testretest reliability, Balance, Older adults, Gujarati version of FAB.

1. Introduction

In 2050, the worldwide population of elderly individual may grow to almost 2 billion, with 80% living in developing countries. This may be alarming as over half the world's elderly live in Asia. In India, a 'senior citizen' or 'older adult' is defined as an individual aged 60 years and older. This can be often fastest growing population in India, increasing from 6.7% in 1991 to 10% in 2021. Between 2001 and 2051, the numbers of old-old (age 70 years and older) is projected to extend 5-fold, and that the oldest-old (age 80 years and older) is expected to increase 4-fold; these increases are faster than for any other age groups. The average remaining length of life is around 18 years (16.7 years for men, 18.9 years for women) at age 60 years and <12 years (10.9 years for men and 12.4 years for women) at age 70 years. [1]

With the normal aging process, humans experience changes within the sensory systems, the central and peripheral nervous systems and in muscles and joints. These multi system losses affect the functions necessary for balance. Falls and resulting injuries became one of the most serious health issues for the elderly. A definite pattern is seen to falls in the elderly as 'post falls syndrome'. Post fall syndrome is defined as 'loss of confidence and voluntary restrictions on activity that's dramatically out of proportion to physical injuries sustained. The amount of falls and severity of injuries are shown to extend with age and limited movements. [2]

Age-related changes in many systems that contribute to an increased likelihood of falls within the elderly. Some examples of musculoskeletal changes include reduction in muscle strength and endurance, and joint flexibility. [3] Examples of age-related changes in sensory system includes

deterioration of proprioception/joint-position sense, reduced visual acuity and contrast sensitivity, [4, 5] and a progressive loss of vestibular hair cells and nerves. Changes within the CNS include loss of neurons and dendrites, decreases within the number of giant pyramidal cells within the motor cortex, a progressive loss of neurons and depletion of neurotransmitters (e. g. Dopamine) within the basal ganglia, and changes in the dendritic tree of motor neurons in the spinal cord. [6]

Many factors contribute to increased fall risk among elderly, include impairments in balance, gait, decreased muscular strength, impaired vision, and increased cognitive impairment. Hazards within the home and community (e. g., poor lighting, lack of stair railings, uneven sidewalks) also contribute to heightened fall risk, particularly among community residing elderly. To know why certain older adults are at a high risk of fall, a number of clinical and laboratory measures of balance and/or gait have been developed. [7]

There are several balance assessment tools to be used with clinical populations; however, a prospective study of 5 clinical balance tests, including the berg balance scale (BBS), timed up-and-go (TUG), and Dynamic Gait Index (DGI), concluded that factors contributing to fall risk in active older adults as they have been found to be in additional frail populations. [8]

The Fullerton Advanced Balance (FAB) Scale was developed to assess multiple dimensions of balance and mobility among higher function older adults; sensory, musculoskeletal, and neuromuscular systems that each of them may be the cause of balance disorder. One of the advantages of the scale is the ability to predict falls in older adults. The English FAB version has already been translated

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in Turkish, Persian and Korean languages. After searching the literature databases such as Google-Scholar, PubMed, Scopus, Science-Direct, etc. did not found any study on the translated Gujarati version of FAB. As a result this scale was not be able to use in Gujarati population who understand only Gujarati language, this study was taken up to translate the FAB scale from English to Gujarati version. Gujarati version of FAB would be useful to assess balance in Gujarati population, who understands only Gujarati language.

The FAB scale

The Fullerton Advanced Balance (FAB) Scale is a multi-item balance-assessment test designed specifically to measure balance in higher-functioning active older adults. Content validity is based on theoretical analysis of components of static balance and dynamic balance control, sensory reception and integration, and anticipatory and reactive postural control. Previously published research⁹ has assessed the psychometric properties of the FAB scale—content and convergent validity, test-retest and intra- and inter-rater reliability, and internal rater consistency—as well as the test's predictive accuracy. Test-retest reliability has been previously reported as ($r=0.96$), and inter-rater reliability in the range of ($r=0.91-0.95$), when the test is administered by trained raters. In predictive accuracy, Hernandez and Rose used receiver operating characteristic analysis to determine cut-off score of 25/40 on the 10-item FAB scale produced the highest sensitivity (74.6%) and specificity (52.6%) in predicting fall status determined by retrospective survey. They further concluded that a practitioner can be confident in more than 7 out of 10 cases that an older adult who scores 25 or lower on the FAB Scale is at high risk for falls and in need of immediate intervention. [10].

Performance on each of the 10 individual test items is scored using a 5-points ordinal scale (0-4) with a maximum score of 40 points possible. The FAB scale is easy and quick to administer, can be conducted in a relatively small area, and requires approximately 10 to 12 minutes to complete. The test requires relatively inexpensive equipment to administer, including a stopwatch, pencil, 12-inch ruler, 6-inch-high bench (length, 18in [45.6]), two 18in lengths of nonslip material, a yardstick, and a metronome. Individual items on the formed in different sensory environments. The 10-item FAB scale involves the participant standing with feet together and eyes closed (item 1), reaching forward to retrieve an object (item 2), turning in a circle (item 3), stepping up and over a bench (item 4), tandem walking (item 5), standing on 1 leg (item 6), standing on foam with eyes closed (item7), jumping for distance (item 8), walking with head turns (item 9), and recovering from an unexpected loss of balance (item10). [9]

2. Materials and Methodology

The participants were selected based on inclusion and exclusion criteria designed for the study. Written informed consent form was received from the participants. Total 50 older individuals were included in this study. The mean age of the participants was 63.34 ± 1.76 . The inclusion criteria were participants who were willing to participate, Male and female individuals, age between 60-75 years. The exclusion

criteria were participants having Alzheimer's or any other neurological disease, participants with vision problem, participants with hearing problem; participants who were mentally unstable were excluded.

Method of translation of questionnaire:

For translation of Fullerton advanced balance scale (FAB) from English language to Gujarati language permission taken for Gujarati version and for validity of the FAB was obtained from the developer of the FAB through E-mail (Dr. D. Rose).

Forward translation:

Two translators, one with the background of medical field (to provide a translation that more closely resembles the original instrument) and second one is layperson who knew both English and Gujarati language were chosen to translate the questionnaire from English to Gujarati language and who is unaware of the objective of the questionnaire, to detect differences in the original questionnaire.¹ Then both the Gujarati versions were combined and two professionals who had knowledge of medical terminologies and were known to both English and Gujarati languages developed a synthesised version of FAB scale.¹²

Back-translation:

The synthesised version of the scale was back translated in English language by two independent translators, who knew both English and Gujarati language and had no information of the original scale which was in English language. To ensure the accuracy of the translation both the translators were not aware about the concepts of scale measures to avoid bias. It helps into reveal misunderstandings or unclear wordings in the initial (English) translations.¹³ Then a bilingual (in English and the Gujarati language) expert panel was convened which included the forward translator person, health experts (who understands medical terminology), and professionals with skill in scale translation and development. Changes were done in translated scale based on the suggestions of the expert panel.

Testing of the FAB scale:

Final Gujarati version of FAB was performed by 50 Elderly individuals, who fulfilled the inclusion & exclusion criteria were selected through convenient sampling. Scale was re-evaluated by same individuals after 24 hours of interval.

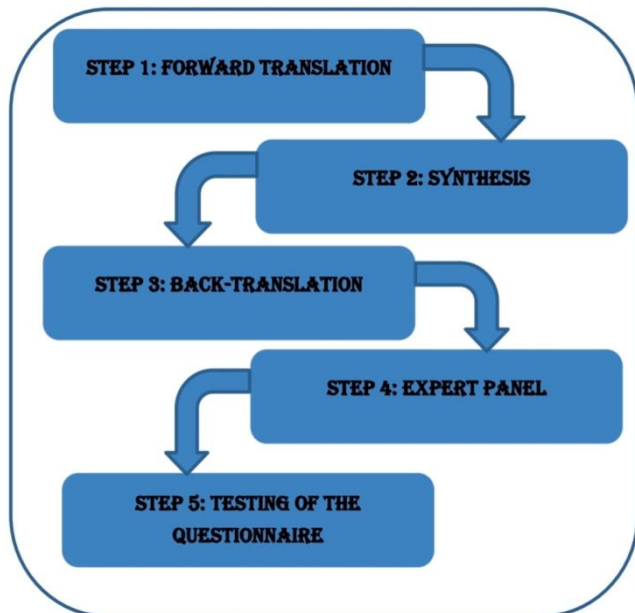


Figure 1: Flow chart of scale translation procedure

Statistical Analysis

Data of 50 individuals were analysed using statistical package for social science version 28 (SPSS v.28) and Microsoft excel 2010. Pearson correlation was used to analyze the validity of the Fullerton Advanced Balance Scale. Test-retest reliability and of Fullerton Advanced Balance Scale was assessed by interclass correlation coefficient (ICC) and Internal consistency was assessed by using Cronbach’s alpha.

3. Results

Table 1: Mean age and Standard deviation

Total Participants	Mean Age	Standard Deviation
N= 50	63.34	1.76

Table 1 shows the mean age of the subjects was 63.34 with a standard deviation (SD) of 1.76 (63.34±1.76) years.

Table 2: Frequency of gender

Gender	Frequency	Percentage
Male	18	36 %
Female	32	64%

Table 2 shows a total of 50 elderly individuals were recruited for the study among the 50 subjects out of which 32 were females and 18 were males.

Gujarati version of Fullerton Advanced Balance Scale validity

Table 3: Pearson Correlation Coefficient

N	Correlation Coefficient	Confidence Interval	P Value
50	0.973	.95-.97	P<0.0001

Table 3 shows The Pearson Correlation Coefficient was 0.973 which suggests that the both the 1st and 2nd evaluation of the Gujarati version of the FAB scale was significantly positively correlated.

Gujarati version of Fullerton Advanced Balance Scale Reliability

Table 4: Test-retest reliability and internal consistency of FAB scale

N	Cronbach’s Alpha		ICC
50	1 st	2 nd	.973
	.985	.981	

Interclass correlation coefficient (95% confidence interval)

Test-retest reliability and of Fullerton Advanced Balance Scale was assessed by interclass correlation coefficient (ICC) (.973) which suggests excellent reliability and Internal consistency was assessed using Cronbach’s alpha, which is .985 for the first and .981 for the second. Values are higher than 0.8 which considered excellent (Table 4).

4. Discussion

Total 50 elderly individuals participated in this study among which 32 were females and 18 were males (Table 1). The mean age of the subjects was 63.34 with a standard deviation (SD) of 1.76 (63.34±1.76) years (Table 2). Test-retest reliability of Fullerton Advanced Balance Scale was calculated by comparing test scores in the first and second evaluation (at 24 hours of interval).

In result of the reliability analysis in this study Cronbach’s alpha values are showed high internal consistency, .985 for the first and .981 for the second. (α values higher than 0.8 are considered excellent, 0.7-0.79 moderate and lower than 0.7 are poor.) The correlation coefficient (ICC) was also very high, test re-test reliability (r=.973). (The values of ICC for relative reliable as follows: poor (0.61), moderate (0.6-0.79), and excellent (0.8)). The results showing that the internal reliability and test-retest association were excellent of Gujarati version of the FAB scale.

Pearson correlation was used to analyze the validity of the Fullerton Advanced Balance Scale. The Pearson Correlation Coefficient was 0.973, which showed high correlation.

The FAB scale is valid and reliable instrument basically designed to evaluate balance, it is currently used not only for adults, but also in different groups such as children with cerebral palsy, patients with Parkinson’s disease. Because this scale is expected to identify balance improvements after given treatment, it is important to determine its responsiveness in different target populations.

The FAB scale provide an assessment tool that measured more dimensions of balance and thereby provide the clinician with more guidance in the design of an individual treatment plan. To achieve these objectives, the FAB scale includes individual test items that are more difficult to perform without imbalance and are therefore more sensitive to subtle changes occurring in multiple dimensions of balance. The inclusion of more individual test items that specifically assess sensory reception and integration abilities, which are integral to good motor planning and execution, also increase the scales sensitivity in detecting changes in balance and mobility. Rose cited that for

beginning the process of establishing content validity of Fullerton Advanced Balance Scale utilised “systems theory of postural control.” According to this theory, the neural control of posture and balance requires a complex interaction of neural (sensory and motor) and musculoskeletal systems, sensory strategies, neuromuscular synergies, internal representations (cognition), and adaptive and anticipatory mechanisms. Therefore, Fullerton Advanced Balance Scale has nearly all of necessary items for balance evaluation. [14]

This study had some limitations. First, the learning effect is short as the interval between test-retest was only 24 hours. It may have influenced the results of the study. Second, it has small sample size. Study difficulties, finding eligible older adults that was a time consuming and difficult process.

These results showed that Fullerton Advanced Balance Scale items, measure balance concept. It is recommended that Gujarati version of scale to be tested in patient groups such as Parkinson’s disease and stroke Based on these results, this scale can be one of the available and helpful measures in clinics to assess balance in older adults and can predict probable falls in this population. In consequence, all of the physical, social, and economical undesirable complications of fall can be prevented.

5. Conclusion

The Gujarati version of FAB scale is reliable, valid and appropriate tool for measuring the balance functions in Gujarati elderly individuals. This scale has ability of discovering subtle changes in the postural control system and contains more challenging tasks than other balance scales. It is capable of indicating probability of first fall in community dwelling older adults. In addition, its evaluative psychometric properties offer the hypothetical evidence for further application in research study among Gujarati elderly individuals also its items can be used for exercise and balance improvement.

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7. Conflict of Interest

No conflict of interest

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Ethical Approval: Approved

References

- [1] Dsouza SA, Rajashekar B, Dsouza HS, Kumar KB. Falls in Indian older adults: a barrier to active ageing. *Asian J Gerontol Geriatr.*2014 Jun; 9 (1): 1-8.
- [2] Chauhan YS. Imbalance and falls in elderly: Review of Literature. *International Journal of Otorhinolaryngology.*2013; 5 (3): 139-41.
- [3] Aniansson A, Hedberg M, Henning GB, Grimby G. Muscle morphology, enzymatic activity, and muscle strength in elderly men: A follow-up study. *Muscle & Nerve: Official Journal of the American Association of Electrodiagnostic Medicine.*1986 Sep; 9 (7): 585-91.
- [4] Sekuler R, Hutman LP. Spatial vision and aging. I: Contrast sensitivity. *Journal of gerontology.*1980 Sep 1; 35 (5): 692-9.
- [5] Menz HB, Lord SR, Fitzpatrick RC. Age-related differences in walking stability. *Age and ageing.*2003 Mar 1; 32 (2): 137-42.
- [6] Maki BE, McIlroy WE. Postural control in the older adult. *Clin Geriatr Med* 1996; 12: 635-658.
- [7] Rose DJ, Lucchese N, Wiersma LD. Development of a multidimensional balance scale for use with functionally independent older adults. *Archives of physical medicine and rehabilitation.*2006 Nov 1; 87: 1478-85.
- [8] Boulgarides LK, McGinty SM, Willett JA, Barnes CW. Use of clinical and impairment-based tests to predict falls by community-dwelling older adults. *Phys Ther.*2003; 83: 328–39
- [9] Hernandez D, Rose DJ. Predicting which older adults will or will not fall using the Fullerton Advanced Balance (FAB) scale. *Arch Phys Med Rehabil.*2008; 89: 2309–15. doi: 10.1016/j.apmr.2008.05.020
- [10] Klein PJ, Fiedler RC, Rose DJ. Rasch analysis of the Fullerton Advanced Balance (FAB) scale. *Physiotherapy Canada.*2011 Jan; 63 (1): 115-25.
- [11] Guillemin F, Bombardier C, Beaton D. Cross-cultural adaptation of health-related quality of life measures: Literature review and proposed guidelines. *J Clin Epidemiol* 1993; 46: 1417-32.
- [12] Hendricson WD, Russell IJ, Prihoda TJ, Jacobson JM, Rogan A, Bishop GD, et al. Development and initial validation of a dual-language English-Spanish format for the Arthritis Impact Measurement Scales. *Arthritis Rheum* 1989; 32: 1153-9.
- [13] Beaton D, Bombardier C, Guillemin F, Ferraz M. Recommendations for the Cross-Cultural Adaptation of the DASH and Quick DASH Outcome Measures. Toronto: Institute for Work and Health; 2007.
- [14] shumway Cook A, Brauer S, Woollacott M. Predicting the probability for falls in community-dwelling older adults using the timed up & go test. *Phys Ther.*2000; 80: 896–903.

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