REVIEW OF FULLERTON ADVANCED BALANCE SCALE IN DIFFERENT POPULATION: A SYSTEMATIC REVIEW

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Abstract

Background: Both static and dynamic functional balance under varying conditions is tested with the FAB Scale. The scale was designed to measure balance in elderly adults, PD, Stroke, MS and Children. In a recent study of the Fullerton advanced balance Scale (FAB) was identified as the most commonly used assessment tool for different population. The aim of this review was to compare simple diagnostic and assessment tool for older adults, PD, MS, Stroke and in children to emphasize those characterized by a good reliability, validity, specificity and sensitivity of FAB Scale.

Objective: The purposes of this study were to conduct a systematic review of the psychometric properties of the FAB Scale in different population.

Methods: The global literature search was conducted in PubMed, Scopus, Science Direct, Web of Science, Cochrane, Google Scholar and MEDLINE search from inception to June 2020.

Results: According to the literature some scales and functional tests in which clinimetric properties had been assessed and eighteenstudies examining the psychometric properties of the FAB Scale with Different population were retrieved. In ten studies of older adults intra and inter-rater reliability were (r= 0.96 and 0.94 to 0.97), content validity was high, sensitivity and specificity were 0.85 and 0.65. Cronbach's alpha for a 10-item model in FAB Scale was 0.805 in older adults. In two studies of stroke intra – inter reliability were 0.96 and 0.972 and concurrent validity with BBS was 0.859. In cerebral palsy population intra – inter rater reliability were 0.96 and 0.92, good correlation with BBS was r=0.75. In normal school going children intra – inter reliability were 0.78 and 0.74, Concurrent validity with Pediatric balance scale was 0.75. In PD reliability was good to excellent and specificity and sensitivity were good. In one study for Persian vesion of FAB Scale in older adult that reliability was good (ICC=0.98) and correlation with BBS was 0.65. The FAB scale, Mini-BESTest, and BBS showed similar accuracy to predict future falls, with values for area under the curve (AUC) of the receiver operating characteristic (ROC) curve of 0.68, 0.65, and 0.69, respectively. A model combining the items "tandem stance," "rise to toes," "one-leg stance," "compensatory stepping backward," "turning," and "placing alternate foot on stool" had an AUC of 0.84 of the ROC curves.

Conclusion: The FAB Scale is a psychometrically sound measure of functional balance impairment for use in different population for assessment and treatment. It is the reliable, valid and good sensitivity effects and specificity.

Keywords: PD (Parkinson's Disease), Multiple Sclerosis (MS), Fullerton Advanced Balance Scale (FAB), stroke, cerebral Palsy(CP), Older Adults, Berg Balance Scale(BBS), Pediatric Balance Scale (PBS).

INTRODUCTION

About FAB Scale

The FAB scale is a performance-based measure that comprehensively addresses the multiple dimensions of balance. The scale was specifically designed for use with independently functioning older adults. Performance on each of the 10 individual test items is scored using a 5-point ordinal scale (0–4) with a maximum score of 40 points possible. The total FAB score was used as a predictor variable in this study.[1]

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.[1]

The test requires relatively inexpensive equipment to administer, including a stopwatch, pencil, 12-inch ruler, 6-inch-high bench (length, 18in [45.6cm]; width, 14in [35.6cm]; height, 6in [15.2cm]), masking tape, 2 foam pads (length, 18.5in [47cm]; width, 15in; height, 2.5in [6.4cm]), two 18in lengths of nonslip material, a yardstick, and a metronome.[1]

Individual items on the FAB scale include static and dynamic balance activities performed 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 (item 7), jumping for distance (item 8), walking with head turns (item 9), and recovering from an unexpected loss of balance (item 10).[1]

About older adults

Definition of the Elder are the frequent presence of multiple pathology and the atypical way in which illness can present with confusion, falls and loss of mobility and day-to-day functioning.[2]

In three division of elder are; Young-old group consists of the population between 65 to 75, in Middle-old group consists between 75 to 85 and old-old group consists between older than 85 years of age.[2]

The number of persons above the age of 60 years is fast growing, especially in India. India as the second most populous country in the world has 76.6 million people at or over the age of 60 constituting above 7.7% of total population.[3]

Falls are an important cause of morbidity and mortality in the elderly. Most often the cause of fall is multifactorial. Falls and their squeal are potentially preventable and hence it is of importance to know the risk factors for falls in the elderly several promising strategies such as exercise programmes, environmental modification, and other educational opportunities for preventing falls and fractures exist.[3]

About Stroke

Stroke often results in impaired balance. Balance is essential for optimal functioning of the locomotor system and the performance of many activities of daily living. Accurate evaluation of balance is important for prescribing appropriate mobility aids, determining the most effective treatment interventions and identifying safe and unsafe activities after stroke. Because balance changes over time after stroke, it also is important to have a quantifiable measure that clinicians can use to monitor these changes and adjust treatment accordingly. [4]

Stroke is defined by World Health Organization (WHO) as a clinical syndrome characterized by rapidly developing clinical symptoms and/or signs of focal and at times global loss of cerebral function, with symptoms lasting more than 24 hours or leading to death, with no apparent cause other than that of vascular origin.[5,6]

About PD

People with Parkinson's disease (PD) are at an increased risk of falling, and measures of balance and measures of falls risk prediction are required. There are many, but there is no review of the evidence as to which are better or worse. It is of paramount importance to adopt assessment tools with sound psychometric properties to ensure accuracy and reproducibility in assessing balance and predicting falls in persons with PD. [7]

About Cerebral Palsy

Cerebral palsy is a neurological disorder affecting the development of movement, posture and balance. It is caused by damage to or abnormalities in the developing brain (Shumway-Cook et al, 2003; Rosenbaum et al, 2007).

Neuromuscular deficits observed in children with cerebral palsy include loss of selective motor control, abnormal muscle tone leading to an imbalance between agonist and antagonist muscles, impaired coordination, sensory deficits and weakness (Franjoine et al, 2003; Woollacott and Shumway-Cook, 2005).

Impaired balance control limits these individuals' ability to recover from unexpected threats to stability. Balance – which includes postural control and equilibrium – is the foundation for all voluntary motor skills and an integral component of appropriate function (Huxham et al, 2001).[8]

Evidence of Reliability of FAB in population

Ten studies for older adults were suggested that Moderate to high reliability has been established for the FAB Scale within a variety of settings and diagnoses. Test-retest reliability was also established using Spearman rank correlation coefficients.

The calculated for the total FAB score was 0.96, demonstrating high reliability. All correlations between individual test items were also significant at the 0.01 level and ranged from 0.52 to 0.82. The lowest coefficients were associated with items 3 (0.52) and 7 (0.64). Good to excellent intrarater reliability was also established for 2 of the raters on all of the individual test items, and for 8 test items for the third rater.[9]

The reliability of the scale to separate persons was 0.81 out of 1.00; the reliability of the scale to separate items in terms of their difficulty was 0.99 out of 1.00. Cronbach's alpha for a 10-item model was 0.805.[10]
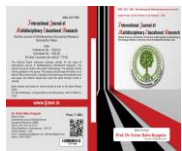
One more study in persion version of FAB Scale in older that the test-retest reliability of individual items indicated good to excellent reliability (Cohen's Kappa= 0.63–1). Intraclass correlation coefficient was excellent (ICC=0.98).[11]

Two studies in PD for FAB reliability were good to excellent and sensitivity was good too.[12]

Two studies in stroke for FAB intra rater reliability is 0.964 and for inter rater reliability Spearman correlation was 0.972 [13-14]

Two other studies for school going children and CP for FAB by two raters for inter rater reliability and by same rater at different time (24 hours of duration) for intra rater reliability.[8 and15]

Evidence of Validity, specificity and sensitivity of FAB in population

Three studies for Fab Scale in older adults convergent and content validity was good   and concurrent validity is 0.847 which show moderately positive correlation.[9-10 and 16]

Fullerton Advanced Balance Scale produced the highest sensitivity (0.85) and specificity (0.65) in predicting faller status in older adults.[17]

No one study for find out validity but sensitivity (0.67) and specificity(0.58), it was good in PD population.[12 and 18]

One study for correlation coefficient (rs) between FAB Scale and BBS was 0.859, it was valid tool for stroke.[13]

No one study for find out sensitivity and specificity in CP but for validity have no specific judgment.

One study for school going children was assessed and concluded that good validity for of FAB Scale with Pediatric balance scale[15], but no other study for specificity and sensitivity.

One study for Construct validity showed moderate to good correlation between the Persian version of FAB and Berg balance scale (r=0.65).[11]

OBJECTIVES

The objective of this systematic review was to examine the reliability, validity, sensitivity, specificity, and comparison of the FAB Scale to predict falls in the different population.

The purposes of this study were to conduct a systematic review of the psychometric properties of the FAB Scale in different population.

METHODS
Search Strategies

A search of the English-language rehabilitation literature published between inception to June 2020 was performed using electronic databases PubMED, Scopus, Science Direct, Web of Science, Cochrane, Google Scholar and MEDLINE. Articles were searched using the following key words: PD (Parkinson's disease), Fullerton advanced balance scale (FAB), stroke, cerebral palsy(CP), older adults, Berg balance scale, Pediatric balance scale (PBS), falls, elderly, neurological, psychometrics testing, validity, reliability, specificity and predicting falls. The reference sections in all found articles were examined to identify other relevant articles.

Results

We identified 21 studies that they examined the psychometric properties of the FAB Scale in older adults, PD, CP, stroke and school going children. A summary of these studies is shown in Table 1.

Table 1. Fullerton advanced Balance Scale (FAB) Evaluation Summary

Criterion	Result
What does the tool measure?	Balance in older adults, Stroke, PD, CP, school going children
at types of clients can the tool be used for?	he FAB was developed for use with community-dwelling elderly individuals. It also can be used in patients withstroke, PD, CP and school going Children.
Is this a screening or assessment tool?	Assessment
Time to administer	Approximately 10–12 minutes to complete by direct observation.

Measurement properties	
Reliability	Ten studies examining excellent intra –inter reliability and one study reliable for Persian version of FAB in older population.
	wo studies concluded good reliability of FAB for stroke and PD population
	ne – one study for good reliability of FAB in CP and school going children
Validity	hree studies for convergent, Content and concurrent good to excellent validity in older adults.
	ne study for convergent validity as good in persion version of FAB in older adults.
	ne study for Good concurrent validity of FAB in stroke
o one study for Validity measure in PD
	ne study for CP for validity but it was not proper judgmental.
ne study for School going children, it had good concurrent validity of FAB with PBS.
Specificity and sensitivity	wo studies detected good Specificity and sensitivity for older adults and PD for FAB.
Feasibility	he FAB Scale requires no specialized training to administer; however, the FAB should only be administered by individuals with knowledge of how to safely manage those with stroke, PD, CP and school going children as it is a risky assessment during which a patient could fall if not supervised by someone withexpertiseinrehabilitation.Relativelylittleequipmentorspace isrequired and less time consuming.

DISCUSSION

This systemic review has been concluded that Fullerton advanced balancev scale is reliable, valid and good comparative with other measures tool for assessing functional balance in older adults, PD, stroke, CP and school going students.

Aishwarya Patil, and Nupoor Kulkarni author conducted a study on Correlation between Fullerton advanced balance scale and timed up and go test in community dwelling older adults and concluded that study proved that there is inverse correlation between Fullerton advanced balance scale and Time up and go test which is statistically significant. So, it is concluded that balance is correlated to fall risk. [19]

Christian Schlenstedt, Stephanie Brombacher author conducted study was Comparison of the Fullerton Advanced Balance Scale, Mini-BESTest, and Berg Balance Scale to Predict Falls in Parkinson Disease concluded that The FAB scale, Mini-BESTest, and BBS provide moderate capacity to predict fall risk.[18]

Clinical Implications

The results of this systematic review have important clinical implications. Overall, the FAB Scale has strong psychometric properties and is valuable in assessing clinical change of functional balance of older adults, stroke, PD, CP and school going children.

Also, rehabilitation can be planned according to component of score. So, this test can be useful to clinicians and also FAB Scale is easy to score, quickly to administer (10-12 min), and requires little space and less equipment.

FAB Scale is valid and reliable to measure functional balance and ability to detect change in anticipatory, reactive postural control, sensory orientation and dynamic gait component this characteristic makes this test unique from other balance tests.

Further recommendation

Need for more Future research can be conducted on Validity, reliability, specificity and sensitivity in PD, Stroke, CP and other neurological condition which have impairment on balance.

Conclusion

The FAB Scale is a psychometrically sound measure of functional balance impairment for use in different population for assessment and treatment. It is the reliable, valid and good sensitivity and specificity for older adults but more Research require for other neurological condition.

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