

## Original Research

# Testing the Validity and Reliability of the Step Test for Elderly Balance

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### ABSTRACT

**Background:** A common problem among the elderly is a decline in functional capacity, which can affect their balance and lead to a high risk of falling. Balance is the ability to maintain body position while stationary or moving. Maintaining balance in the elderly is important to enable them to remain independent in performing various daily activities. The Step Test is one of the measurement tools that can be used to determine the level of balance in the elderly. The purpose of this study was to determine the validity and reliability of the Step Test in measuring balance in the elderly by comparing it with the Berg Balance Scale (BBS).

**Methods:** This study used a descriptive research design with an observational method involving 20 elderly subjects.

**Results:** Based on the validity test,  $p=0.001$  and  $r=0.689$  were obtained, which means that there is a strong relationship between the Step Test and the Berg Balance Scale (BBS). The interrater reliability test yielded a result of  $p=0.000$  and  $ICC=0.897$ , while the intrarater reliability test yielded a result of  $p=0.000$  and  $ICC=0.881$ .

**Conclusion:** The Step Test is proven to be valid and reliable for measuring balance in the elderly. The Step Test is recommended for use in detecting the risk of falling more quickly and accurately in the elderly.

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## INTRODUCTION

Efforts to improve national development to date, particularly in the fields of health and social welfare, have resulted in an increase in the average life expectancy of the population. This growth is due to an increase in the overall life expectancy of the population, which has resulted in an increase in the number of elderly people (BPS, 2021). According to Law No. 13 of 1998, elderly people are those who have reached the age of 60 and above and have the same rights in social, national, and state life.

The Central Statistics Agency reports that the elderly population in Central Java Province as a percentage of the total population continues to increase. In 2005, the percentage of elderly people was around 9.41%, in 2010 around 10.34%, in 2015 around 11.79%, and 13.48% in 2019. Meanwhile, the elderly population in Semarang

City continues to increase. In 2016, the number of elderly people reached 141 thousand or 8.17% of the total population of Semarang City, then increased to 148 thousand or 8.47% in 2017, and by 2020, the number of elderly people in Semarang City had increased to 170 thousand or 9.29% (BPS Central Java, 2020).

The aging process is a stage marked by a decline in bodily functions. In this case, there are cumulative changes, including the body, tissues, and cells, which experience a decline in functional capacity. This can be linked to degenerative changes in the skin, bones, heart, blood vessels, lungs, nerves, and other body tissues. The aging process affects changes in the body's systems, one of which is the musculoskeletal system in the elderly, which experiences changes in the form of a decrease in bone fluid, making it brittle (osteoporosis), hunched (kyphosis), enlarged and stiff joints (muscle atrophy), cramps, tremors, tendon shrinkage, and sclerosis. This can affect the balance of the elderly, resulting in a high risk of falls among the elderly (Kholifah, 2016).

Balance is an individual's ability to maintain their body position or return to their center of mass over time with the help of good posture, which can be achieved with minimal muscle work. Improving balance in older adults is very important because balance is an important component that must always be maintained and improved in older adults. Maintaining balance in older adults is important in order to enable them to remain independent in carrying out various daily activities. The more balanced an older adult's body is, the better their bodily functions and control are maintained (Shahzad et al., 2017).

To determine whether someone has a balance disorder, a balance test is required. In selecting a balance test measurement tool, practical aspects need to be considered. One way to measure both dynamic and static balance is with the Step Test (Rahman & Widiyastuti, 2014). The Step Test is a dynamic balance test that aims to measure a person's balance by counting the number of steps they can take in 15 seconds (Rahman & Widiyastuti, 2014). The advantage of this balance measurement tool (Step Test) is that its use and procedure are very simple, requiring minimal and easily accessible equipment (Purnomo, 2018).

Every measuring instrument used for research purposes must demonstrate validity and reliability. The validity and reliability of a balance measuring instrument are very important for a physiotherapist with the aim of assessing the balance status of patients (Janna, 2020). In this study, the author wanted to determine the "Validity and Reliability Test of the Step Test on Elderly Balance."

## **MATERIALS AND METHOD**

This study used a descriptive research design with an observational approach that aimed to test the validity and reliability of the Step Test in measuring balance in the elderly. This design was chosen because it was able to provide an objective and systematic description of the efficacy of the measuring instrument without requiring direct intervention on the subjects. Validity testing was conducted through correlation between the Step Test results and the Berg Balance Scale as a standard tool, while reliability was tested through interrater and intrarater methods with repeated measurements by several trained measures.

The research took place at the "Pucang Gading" Elderly Social Service Home in Semarang Regency from October to December 2022. The research sample consisted of elderly people aged at least 60 years who lived in the home and met the inclusion and exclusion criteria. The sampling technique used was purposive sampling with a sample

size of 20 people. The sample size was calculated according to statistical standards to ensure the scientific validity of the research results.

The inclusion criteria included elderly people aged 60 years and above who were able to communicate and follow simple instructions, while the exclusion criteria included elderly people with neurological diseases, severe balance disorders, and gait disorders. The research variables included the results of the Step Test validity and reliability tests as independent variables, and the elderly's balance level measured using the Berg Balance Scale as a dependent variable. The main instruments were visual-based measuring devices and stopwatches that had been tested for validity and reliability beforehand.

The data collection procedure was carried out through repeated measurements by three different measurers for interrater reliability, and by the same measurer at different times for intrarater reliability. The data were processed using the Intraclass Correlation Coefficient (ICC) and Pearson's correlation to assess the reliability and validity of the measuring instruments. This study obtained official permission from the Central Java Provincial Social Service with number 071/2326, dated November 11, 2022, which indicates that the study has undergone an ethical process in accordance with national standards.

Data analysis was performed using SPSS software version 26, following the procedures for normality testing, validity testing, and reliability testing. The research results will be compiled narratively and quantitatively to describe the level of validity and reliability of the Step Test as a measure of balance in the elderly. This study also complies with ethical aspects as it has obtained official permission from the relevant agencies and guarantees the protection of the rights and welfare of the research subjects during the process.

## RESULTS

**Table 1.** Respondent Characteristics (n = 20)

Variable	Category	Frequency (n)	Percentage
Gender	Male	10	50
	Female	10	50
Age (years)	60–64	4	20
	65–69	7	35
	70–74	6	30
	75–78	3	15

Table 1 shows that the number of male and female respondents was balanced (50% each). The average age of respondents was 70.70 years with a standard deviation of 4.68 years, indicating that most respondents were in the late elderly category. The homogeneous age distribution illustrates that the sample was sufficiently uniform to assess body balance in the elderly.

**Table 2.** Data Normality Test (Shapiro–Wilk Test)

Variable	p-value	Description
Step Test Measure I	0.12	Normal
Step Test Measure II	0.512	Normal

Variable	p-value	Description
Step Test Measurer III	0.176	Normal
Berg Balance Scale (BBS)	0.065	Normal

Table 2 shows that all variables have *p-values* > 0.05, so the data is declared to be normally distributed. These results indicate that the Step Test and Berg Balance Scale scores meet the parametric assumptions for validity and reliability testing. Thus, further analysis was performed using Pearson's test and ICC.

**Table 3.** Step Test Validity Test against Berg Balance Scale (BBS)

Variable	r	p-value	Interpretation
Step Test vs BBS	0.689	0.001	Valid, strong and significant relationship

Table 3 shows a correlation coefficient value of  $r = 0.689$  with a *p-value* of 0.001 (< 0.05), which means there is a strong and significant relationship between the Step Test and BBS. This means that the better the Step Test results, the higher the balance score measured by BBS. Thus, the Step Test is proven to be valid as a measure of dynamic balance in the elderly.

**Table 4.** Step Test Reliability Test (Interrater and Intrarater)

Type of Reliability	ICC	p-value	Reliability Category
Interrater	0.897	0.001	Very Good
Intrarater	0.881	0.001	Very Good

Table 4 shows that the *interrater ICC* value = 0.897 and the *intrarater ICC* = 0.881 with  $p = 0.000$ , indicating excellent reliability ( $ICC > 0.75$ ). These results illustrate that the Step Test provides consistent results, both when measured by different testers and by the same tester at different times.

## DISCUSSION

The results of this study indicate that the Step Test has strong validity and excellent reliability as a tool for measuring dynamic balance in the elderly. The strong relationship between the Step Test and the Berg Balance Scale proves that both are capable of assessing body balance ability consistently. These findings support the Step Test as a simple, efficient, and practical alternative measurement tool for use in various health care facilities (Purnomo, 2018).

This study is in line with the results of a previous study by Widodo (n.d.), which showed that the Step Test is reliable in both inter- and intra-rater measurements. Similar results were also reported by Lee et al., (2017) who found high validity and reliability of the Step Test in stroke patients with strong correlations to the Berg Balance Scale and 10-Meter Walk Test. The similarity of these findings strengthens the evidence that the Step Test has stable evaluative capabilities in various age groups and clinical conditions, both in healthy elderly people and patients with balance disorders.

Balance is an important aspect that must be maintained in the elderly, as it plays a role in maintaining independence and preventing the risk of falls. According to Shahzad

et al., (2017) balance disorders can increase the risk of injury and reduce the quality of life of the elderly. Therefore, the use of the Step Test in routine examinations can help with the early detection of balance disorders. This step is important so that health workers can provide early fall prevention interventions and support the elderly to remain independent in their daily activities.

From a clinical application perspective, the Step Test is considered superior because it does not require complex equipment, takes little time to perform, and is easy for healthcare professionals to administer. These findings are relevant to the views of Irfan (2016) and Prasetyo and Indardi (2015), who stated that assessing motor function and body balance is very useful for improving functional activity and reducing dependence on others. Based on these results, the Step Test can be applied in various health care facilities, including general hospitals and psychiatric hospitals such as Dr. Amino Gondohutomo Provincial Mental Hospital in Central Java, because the procedure is simple and can be performed on patients with mild motor limitations.

However, this study has several methodological limitations. The sample size was only 20 respondents, so the results of this study do not fully represent the elderly population in general. In addition, the limited literature specifically discussing the Step Test in the elderly population also poses an obstacle to the discussion. According to Singarimbun and Shofian, (1995) a minimum of 30 respondents is required for the data distribution to be close to normal. Therefore, further research with a larger sample size is needed to increase the strength of the generalization of this study's results.

Based on these findings and limitations, it is recommended that future studies involve a larger sample size and consider variations in the characteristics of the elderly. In addition, comparisons between the Step Test and other balance measurement tools such as the Timed Up and Go Test or Functional Reach Test can be made to obtain a more comprehensive picture. Training for healthcare workers on the Step Test procedure is also important to ensure more accurate and consistent measurement results. Thus, the Step Test can be integrated as part of routine balance assessment for older adults in healthcare facilities.

## **CONCLUSION**

Based on the research results and discussion, it can be concluded that the Step Test has strong validity and excellent reliability as a dynamic balance measurement tool for the elderly. The results of the study show a consistent positive relationship between the Step Test and the Berg Balance Scale, as well as a high level of measurement agreement between and within testers. These findings confirm that the Step Test can be used as a simple, efficient, and easy-to-apply measurement tool in physiotherapy practice and public health services. Therefore, it is recommended that the Step Test be routinely implemented in various health facilities, including hospitals and community health centers, as part of balance screening for the elderly.

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## REFERENCES

- BPS Jawa Tengah. (2020). *Profil lansia 2020*. Badan Pusat Statistik Provinsi Jawa Tengah.
- BPS Kota Semarang. (2021). *Profil lansia Kota Semarang 2019*. Badan Pusat Statistik Kota Semarang.
- Budiastuti, D., & Bandur, A. (2018). *Validitas dan reliabilitas penelitian*. In Binus.
- Irfan, M. (2016). *Keseimbangan pada manusia*. Ikatan Fisioterapi Indonesia.
- Ismunarti, D. H., Zainuri, M., Sugianto, D. N., & Saputra, S. W. (2020). Pengujian reliabilitas instrumen terhadap variabel kontinu untuk pengukuran konsentrasi klorofil-A perairan. *Buletin Oseanografi Marina*, 9(1), 1–8. <https://doi.org/10.14710/buloma.v9i1.23924>
- Janna, N. M. (2020). Konsep uji validitas dan reliabilitas dengan menggunakan SPSS. Sekolah Tinggi Agama Islam (STAI) Darul Dakwah Wal-Irsyad (DDI) Kota Makassar, 18210047, 1–13.
- Kholifah, S. N. (2016). *Keperawatan gerontik* (M. Dwisatyadini, Ed.; Cetakan Pe). Pusdik SDM Kesehatan.
- Lee, B., Choi, H., & An, S. (2017). The relative absolute reliability and validity of step test in patients with chronic stroke. *Journal of The Korean Society of Integrative Medicine*, 5(1), 43–53.
- Mekayanti, A., Indrayani, & Dewi, K. (2015). Optimalisasi kelenturan (flexibility), keseimbangan (balance), dan kekuatan (strength) tubuh manusia secara instan dengan menggunakan "secret method." *Jurnal Virgin*, 1(1), 40–49.
- Nuryadi, Astuti, T. D., Utami, E. S., & Budiantara, M. (2017). *Buku ajar dasar-dasar statistik penelitian*.
- Prasetyo, A., & Indardi, N. (2015). Pengaruh senam sehat Indonesia terhadap keseimbangan tubuh lansia di kabupaten Sragen. *Journal of Sport Sciences and Fitness*, 4(1), 28–31.
- Polit, D. F., & Beck, C. T. (2018). *Essentials of nursing research: Appraising evidence for nursing practice* (9th ed.). Wolters Kluwer.
- Purnomo, D. (2018). Uji validitas dan reliabilitas step test sebagai alat ukur keseimbangan pada lansia. *Jurnal Fisioterapi dan Rehabilitasi*, 2(2), 53–70.
- Sari, S. Amelia. (2017a). *Intra rater dan inter rater reliability*, 549, 40–42.
- Setyawan, D. A. (2020). *Petunjuk praktikum uji normalitas & uji homogenitas data dengan SPSS*. Paper Knowledge: Toward a Media History of Documents.

- Shahzad, A., Ko, S., Lee, S., Lee, J. A., & Kim, K. (2017). Quantitative assessment of balance impairment for fall-risk estimation using wearable triaxial accelerometer. *IEEE Sensors Journal*, 17(20), 6743–6751.
- Supriadi. (2018). Lanjut usia dan permasalahannya. *Jurnal PPKn & Hukum*, 10(2), 84–94.