This is the accepted manuscript version of an article published by Karger Publishers in **Dementia and Geriatric Cognitive Disorders** 51(1) : 18–25 (2022) and available on https://doi.org/10.1159/000521099

Research Article

Manuscript Title

Alusti Test: new functional assessment scale for universal application in psychogeriatric populations.

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Short Title: Alusti Test functional psicogeriatric assessment scale

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Number of Tables: 4.

Number of Figures: 1.

Word count: Abstract 244 and body text 2520.

Keywords: Physical functional performance, geriatric assessment, dementia, memory disorders, long-term care.

Abstract

Introduction. Decreases in functional ability generate dependence, limiting people's quality of life. Assessment tools are needed to evaluate functional abilities of the older adults, that can objectively and accurately assess any type of user. Such proper or adapted tools are not always available. The aim of this study was to demonstrate the usefulness and universal application of the Alusti Test, a functional assessment scale, in the older population and to evaluate the sensitivity to change of the Alusti Test–short version in a psychogeriatric hospitalized population.

Methods. Longitudinal study in a Psycogeriatric Clinic in Navarra, Spain. The study sample comprised 539 persons 65 years and older hospitalized at a psychogeriatric clinic (mean age 82.8 ± 7.3 years). The sensitivity to change was assessed upon admission and discharge through the application of three tests: Barthel Index (BI), Complete Alusti Test, and Alusti Test–short version.

Results. We verified sensitivity to change, as illustrated by an improvement of 24.7%, 13.8%, and 16.0%, respectively. Due to the greater functional deterioration upon admission, the improvement margin in the three tests was higher in patients over 85 years of age and in women.

Conclusion. We consider the Alusti Test an innovative functional assessment tool due to its simplicity, sensitivity, and suitability to universal application in psychogeriatric populations. Correlating recommended physical activity based on the functional ability of the person, based on the Alusti Test, is a pending task that could be of interest for the sake of efficient interventions.

Introduction

Functional independence is the ability to perform the functions of daily living, that is, to live autonomously in the community, receiving little or no help from others [1]. In the European Union (EU), the old-age dependency ratio was 29.9% in 2017; that is, a little more than three people of working age for every person over 65 years of age. In other words, the functional dependency of the EU has been increasing for a long time [2]. Many older people who age in good health and actively nevertheless experience a decrease/worsening of their functional ability [3]. Functional capacity is one of the best indicators of health and quality of life and is a predictor of morbidity and mortality and of the consumption of health resources [4]. Its decline generates dependence, limiting people's quality of life. Promoting a healthy lifestyle and prescribing physical exercise have effectively improved the functional ability in the general population as well as in frail older persons [4,5] and the cognitively impaired and/or demented geriatric population [6].

Therefore, it is a priority to assess the geriatric population from the functional point of view [7], through well-known tests such as gait speed (GS), grip strength, Timed Up & Go (TUG), the Short Physical Performance Battery (SPPB), and the Tinetti test. Nevertheless, their usefulness and applicability are limited by the physical and cognitive state of the person assessed [6,8,9]. Consequently, severe cognitive deterioration as measured using the Mini-Mental State Examination (MMSE) has been considered an exclusion criterion, due to lack of reliability, in the functional monitoring of the older adults [6,10,11]. Assessing the functional ability of every geriatric population should be possible, though, by means of an objective evaluation methodology, and independently of their cognitive status.

Evaluation tools are needed that are capable of objectively and accurately assessing the functional ability of any type of user and that permit monitoring of this ability [7,12].

Functional assessment test

Gait speed (GS) is associated with health outcomes and is used as an objective measure of mobility in clinical and research settings. It has high reliability but limited applicability [12,13]. The muscle mass index has been used to evaluate the risk of developing functional disorders [14,15]. At present, however, muscle strength is considered a better indicator, the deterioration of which is associated with a slow GS [15,16]. Physical performance is the ability to perform physical activities, and is considered a mediating variable of the person's functional situation. The grip strength has been shown to be a good marker of physical performance in the older community-dwelling population, as well as a powerful predictor of disability and morbidity and mortality [17-19]. The effectiveness of the SPPB is

also demonstrated, as well as its ability to predict mobility and disability, but its applicability is equally limited [18,20,21].

The Alusti Test is a functional assessment scale, universally applicable in older population regardless of their functional and cognitive status. Its objective is to measure the baseline functional situation in order to try to improve it. When designing this new test, we considered that it should comply with the characteristics of simplicity, applicability, reproducibility, validity, and acceptance. On the other hand, it should have good sensitivity to change and a good level of correlation with other scales and indices already used to assess the geriatric population. In the absence of a "gold standard," we selected five scales as benchmarks: BI, SPPB, TUG, Tinetti test, and GS. The comparative analysis of the different scales with the two versions of the Alusti Test shows, in summary, a good intraclass correlation coefficient and greater applicability in the dependent population. The purpose of this study was to demonstrate the usefulness and universal application of the Alusti Test in its full and short versions, in the psychogeriatric population, independently of their functional and cognitive status. The specific objective was to evaluate the sensitivity to change of the Alusti test–short version in a comparative sample, which also includes the full Alusti test and the BI in hospitalized older adults and their functional assessments performed before and after the hospitalization [22].

Materials and Methods

Study design and participants

This longitudinal study received approval from the Ethics Committee of Matia Fundazioa in San Sebastián (Spain). All participants, or their legal representatives in case of disability, signed an informed consent authorizing each evaluation.

The study was carried out in a geriatric population hospitalized in the Josefina Arregui Psychogeriatric Clinic in Navarra (Spain) between January 2, 2015, and July 19, 2018. As inclusion criteria, the following were considered: clinical situation at admission that permits an assessment, being discharged from the hospital, and willingness to participate. No exclusion criteria were established.

During this period, a physiotherapist completed the functional assessment upon admission and discharge of 625 hospitalized older people, using the BI, the full Alusti Test, and the Alusti Test–short version. Of these 625 people, in 86, the application of the full Alusti test was impossible due to lack of collaboration/understanding of the study population. The BI and the Alusti test–short version were applied to all older persons included in the study. Therefore, 539 older adults took the three tests and constituted the sample analyzed in this study.

The BI is one of the most frequently used tools to assess physical functioning [23]. It assesses the level of independence of the person in carrying out some basic activities of daily living (BADLs) [24].

In its full version (Supplemental A), the application of the Alusti test, designed for the physical and functional assessment of the older population, requires collaboration from the person evaluated. It includes the following variables: 1. Passive joint mobility, 2. Active muscular mobility, 3. Transfer from supine to sitting position, 4. Sitting trunk, 5. Transfer from sitting to standing, 6. Standing, 7. Walking , 8. Walking action range, 9. Tandem with closed eyes, 10. Monopodal support with closed eyes [22].

The Alusti test–short version (Supplemental B) permits assessing the functional situation of people with insufficient and even null cooperation, and is composed of the following variables: passive joint mobility of extremities, trunk maintenance in sitting and standing position, walking and range of motion (shown in Table 1). Thus, to perform the test, we start from the lying position, move to the sitting position, and finish standing. Each of the variables has threshold scores ranging from 0 to 2, 5, 7, 10, and 25 [22].

The maximum score on the Alusti test–full version is 100 points and on the short version, 50 points, corresponding to an excellent/preserved mobility situation, respectively. The minimum score for both versions is 0 points, which corresponds to a situation of total dependence [22].

Statistical methods

The statistical analysis was performed using IMB SPSS Statistic v23 statistical software package (SPSS Inc., Chicago, IL). To compare the results between the three tests at admission and discharge, the paired t-test was used. To analyze the sensitivity to change (hospital admission and discharge) between men and women, and between older adults under and over 85 years of age, Student's t-test for parametric samples was used. P-values <0.05 were considered as statistically significant differences.

Results

The Alusti test–short version is a test designed for universal application in the older population. Unlike the full version, it does not require collaboration or understanding from the older person to be evaluated. The short version is part of the full Alusti Test and its levels of correlation have been tested and published [22].

Next, the results of the total sample and subgroups are exposed according to age (under 85 years and over 85 years) and sex.

The 539 subjects who participated in this study, being 235 men (43.6%) and 304 women (56.4%), had an average age of 82.8 + 7.3 years.

Regarding their functional status upon admission, the mean BI was 48.1 + 25.3 points, with 237 subjects presenting total dependence (BI <45 points), 113 subjects severe (BI 45-59), 102 moderate (BI 60) -79), 64 mild (BI 80-94) and 23 autonomous persons (BI 95-100). The average BI of men was 47.6 + 24.1 points, and that of women was 48.5 +26.3 points. Taking age into account, the average BI of people under 85 was 53.7 ± 25.8 and of people over 85 years of age 40.6 + 22.6.

Regarding their cognitive status, according to the MMSE, 214 subjects (39.7%) scored <11 points (low), 259 subjects (48.1%) from 11 to 20 points (average) and 66 subjects (12.2%)> 20 points (high). In the group of women, 119 have presented a low MMSE, 151 medium and 34 high. In the group of men, 95 obtained a low MMSE, 108 medium and 32 high. According to age, in the group of people under 85 (N = 307), 103 had a low MMSE, 150 medium and 54 high. In the group of people older than 85 years (N = 232), 111 obtained a low MMSE, 109 medium and 12 high.

In this geriatric hospitalized population under analysis, on a maximum score of 50 points on the short version of the Alusti test, upon admission, the minimum result was 1 point and the maximum 50 points. At discharge, the scores ranged between 4 and 50 points.

Figure 1 shows the results of the older patients evaluated at admission and discharge.

Shown in Table 2, the net deviations found in the functional assessments after the hospitalization period.

Concerning the results women obtained upon admission when compared to men, based on the three tests, women show a better functional status upon admission when compared to men (shown in Table 3).

Shown in Table 4, the results of the three functional tests in individuals younger and older than 85 years. The net and percentage improvement found were greater in older adults over age 85.

Discussion/Conclusion

In recent years, few new functional and physical assessment tools have been created for older persons.

The personalized prescription of physical exercise is progressively booming in the society we live in [25]. Likewise, some authors point out the importance of identifying older people at risk of functional deterioration [26]. Assessment is the previous and necessary step to intervene in an efficient, personalized and generalized manner. The decision needs to be made in collaboration with the user/family and a care plan needs to be developed in any healthcare setting, but especially after hospital discharge [27-30]. Although there are various ways to assess functional status, the assessment of older adults who are discharged from hospital and who return to their usual home is limited mainly

to the basic activities of daily living (BADLs). It is important to know the objectives that older people have in relation to their functional status, how they think about their functioning in the hospital and at home. Being able to identify these objectives early, while they are in the hospital, is the first step to recovering their ideal or premorbid function after the hospital discharge [31]. The two versions of the Alusti Test permit evaluating and quantifying the functional situation of the psychogeriatric population.

A recently published study proposes a new functional classification based on the basic (BADLs) and instrumental activities (IADLs) of daily living, and based on frailty, which can stratify the risk of mortality in older persons [32]. Another recent publication describes the use of a new platform/unstable surface to assess the dynamic balancing capacity of people over 65 living in the community. The average age of the participants is 70.5 + 3.5 years and the average MMSE score is 28.6 points, taking into account that one of the exclusion criteria to participate in this study is an MMSE score <24 [33]. Other authors develop a new evaluation of the activities of daily living to determine the deterioration in daily functioning and ensure an early diagnosis of neurocognitive disorders in community-dwelling people over 65 years of age. The average age of the participants was 79.8 years and the average MMSE score was 25.5 points. In this study, the participation of people without cognitive impairment (mean MMSE 28.6 +1.2) was taken into account, as well as of older adults with mild cognitive impairment (mean MMSE 26.1 + 2.0) and Alzheimer's disease (mean MMSE 21.7 + 2.8) [34]. These last two studies make distinctions according to the level of cognitive impairment. Comparing our results with those previously mentioned, we found that the average age of the participants in our study is higher and that almost 40% have severe cognitive impairment.

Reliability, validity, acceptance [35] and ceiling-floor effect are desirable characteristics of a test applicable in the geriatric population, recently corroborated in the Alusti Test, in its full and short versions [22].

In this hospitalized psychogeriatric population sample, we demonstrated the utility of the Alusti Test in the entire population, and found support for the broad ceiling-floor effect. We consider it a test applicable to all older people, including those with cognitive impairment (MMSE <20), and easy to apply. Therefore, we believe that the Alusti Test responds to the demand for new assessment tools proposed by other authors [11].

Likewise, we have verified that the Alusti test–short version presents a sensitivity to change that correlates directly with the full Alusti Test and the BI. This sensitivity permits functional monitoring of the entire older population, including the psychogeriatric population. We also found that sensitivity to change is greater in the most vulnerable population. In fact, those over 85 years of age obtain a greater

percentage variation of functional improvement, which we believe is due to the fact that, in their starting situation (hospitalization), the functional results with the short version of the Alusti test, and with the others, are lower, so that its hypothetical improvement margin is greater. The Alusti test–short version is sensitive to change in the global population, in men and women, and in older people under and over 85 years of age.

This shows the need to encourage new studies on functional assessment tools in older adults, which take into account the participation of an older people or with severe cognitive impairment. Meanwhile, we consider the Alusti test an innovative functional assessment tool, due to its simplicity, sensitivity, and applicability to all segments of the older population; that is, it is capable of assessing 100% of the older adults regardless of their functional and cognitive status. It permits a single individual assessment, each person gets his/her own score, between 0 and 50 or 100 (short or full version), which corresponds to the older person's actual situation and level of global mobility.

The strengths of this study include the range of the study sample, the high average age of the sample and the representativeness of a large segment of the hospitalized older population.

The application of the different scales in each user by the same evaluator, with knowledge of the results obtained, can be considered a weakness or methodological limitation.

In conclusion, we consider the Alusti Test an innovative functional assessment tool due to its simplicity, sensitivity and universal application in psychogeriatric populations. Correlating recommended physical activity based on the person's functional ability, based on the results obtained on the Alusti test, is a pending task that could be of interest for the sake of an efficient intervention.

Acknowledgement

We would like to thank the Josefina Arregui Psychogeriatric Clinic and all the participants for making this study possible. We would also like to thank Alazne Altuna, Gema Louzao, Teresa Marcellán, Patricia Garmendia, Sergio Alfonso, Nicolás Martínez and Elixabete Pérez for their valuable contributions.

Statement of Ethics

This research was reviewed and approved by Ethics Committee of Matia Fundazioa (minutes number 72 of the bioethics committee of 19/09/2017) in San Sebastián (Spain),. All participants, or their legal representatives in case of disability, signed an informed consent authorizing each evaluation.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Funding Sources

This research did not receive any funding from agencies in the public, commercial, or not-for-profit sectors.

Author Contributions

All authors meet the criteria for authorship stated in the Uniform Requirements for Manuscripts Submitted to Biomedical Journals, and have approved the final version to be published. Below, I list the specific areas of contribution of the authors:

Conception and design: JA, JJCA, OB.

Acquisition of data: JA, JU.

Analysis and interpretation of data: JJCA, JA, MU.

Drafting of the manuscript: MU.

Critical revision of the manuscript for important intellectual content: JA, JJCA, OB, JU, MU.

Final approval of the version to be published: JA, JJCA, OB, JU, MU.

Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved: JA, JJCA, OB, JU, MU.

Data Availability Statement

The data that support the findings of this study are openly available in figshare at http://doi.org/[10.6084 / m9.figshare.15043050], reference number

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Figure legends

Fig. 1. Functional test results and mean variations in the study population. The graph shows the results of the 539 patients evaluated at admission and discharge. The data confirm a sensitivity to change of 24.7% in the BI, of 16.0% in the Alusti test–short version and of 13.8% in the full Alusti test.

Alusti-C: Complete Alusti Test (0-100); Alusti-S: Alusti Test–short version (0-50); BI: Barthel Index (0-100).