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Impact of functional determinants on 5.5-year mortality in Amazon riparian elderly

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ABSTRACT

Objective. *To ascertain whether modifiable physical performance–based measurements predicted 5.5-year mortality in a riparian elderly cohort in the Amazon rainforest region.*

Methods. *A longitudinal study evaluating the impact of functional determinants on 5.5-year mortality in a riparian elderly cohort from Maués City in the state of Amazonas, Brazil, was performed. The study was a follow-up of a previous observational investigation that evaluated various fitness tests in 630 Amazonian riparian elderly (291 males and 339 females) aged 72.3 ± 8.0 (60–99) years old. The cohort was selected for its adverse environmental conditions, which increased the risk of falls yet required maintenance of good physical condition for carrying out relatively rigorous daily activities, and restricted access to specialized health services. Official death records were obtained from the Maués Municipal Health Department.*

Results. *A total of 80 study participants (12.7%) died over the 5.5-year study period. Kaplan-Meier regression analysis showed significant association between Timed Up and Go (TUG) test scores ≥ 14 seconds and mortality risk, independent of sex, age, and other health variables.*

Conclusions. *The study results suggest that the TUG test can be used as an indicator for initiating therapeutic and preventive actions, including conducting exercises or physical activities adapted to the health and functional conditions of the elderly, by identifying elderly people with a higher relative risk of mortality.*

Key words Mortality; risk; aged; Brazil; Americas.

Aging is strongly associated with an increase in numerous dysfunctions and chronic degenerative diseases, accompanied by a decrease in functional performance. Previous epidemiological investigations have suggested that disability stemming from a decline in the level of everyday activities is more predictive of mortality among older people than the presence of multiple morbidities (1). For that reason, functional tests have been developed to determine some aspects of elderly people's physical performance that can represent risk of mortality (2–5).

Evaluations of walking speed, standing balance, cardiorespiratory capacity, handgrip strength, leg strength, chair rise, endurance, and other aspects of functional performance are used to assess general physical performance of the elderly. Some research studies have shown that reduced physical performance measured by handgrip strength, chair rise, or standing balance can 1) predict future difficulties in carrying out certain daily activities and 2) increase the risk of mortality

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in the elderly (6–9). Therefore, it is hypothesized that disability evaluated by physical performance aspects could be more predictive of mortality among older people than multi-morbidity (1).

Despite the robust evidence on the impact of physical performance on longevity among the elderly, there is currently no universal consensus on which functional tests could be used to predict risk of mortality in this population. The lack of a standardized approach to predicting mortality risk in this population may be related to the variability of results currently available on this issue, which is in turn a result of the large number of lifestyle, health, and social modifying variables that pertain to elderly people.

Given these issues, analyzing the reliability of functional tests in measuring mortality risk in an elderly population in a remote environment with restricted access to highly specialized health services is highly beneficial, as it can help identify the specific physical performance evaluations that can best predict this risk regardless of the quality of available health services. Amazon riparian elderly were chosen as the study cohort because they live in adverse physical conditions that increase their risk of falls and at the same time require maintenance of good physical condition for carrying out relatively rigorous daily activities that include the use of boats as a means of transportation, and long walks on uneven ground. This characterization of the study population was based on a previous cross-sectional investigation performed by Maia-Ribeiro et al. (10) that evaluated the association between several socioeconomic, clinical, anthropometric, balance, and functional factors, and the risk of falling, among a cohort of 637 riparian elderly residents (≥ 60 years old). The sample was selected from the population of 2 900 elderly individuals that lived in the city of Maués in Amazonas, Brazil. Overall, Maia-Ribeiro et al.'s results suggested that falls experienced by the riparian elderly in this area were strongly associated with the challenging environmental conditions related to daily life rather than biological and health factors.

Given the initial results described by Maia-Ribeiro et al. (10), this study aimed to ascertain whether modifiable physical performance–based measurements predicted 5.5-year mortality in the riparian elderly cohort in Maués.

MATERIALS AND METHODS

Study design and population

This prospective observational investigation included 630 Amazon riparian elderly living in the city of Maués in the state of Amazonas, Brazil (291 males (46.2%) and 339 females (53.8%)) who had previously participated in a study that analyzed the association between health and functional fitness factors and falls (10). The baseline assessment performed in July 2009 included 637 subjects, but in the current study, seven of those individuals were excluded due to incomplete data. The mean age of the riparian elderly sample at the time of their inclusion in the baseline study was 72.3 ± 8.0 (60–99) years. The baseline riparian elderly study cohort represented 61% of the elderly population residing in Maués in 2009 (n = 2 900). Maués is located in the Amazon rainforest and is not accessible by road. Riparian elderly in this city must be physically active to carry out their daily activities, many of which expose them to a significant risk of falls (Figure 1). The study inclusion criteria were as follows: 1) easy access to Family Health Program (FHP) services; 2) residence in Maués at the time of data collection; and 3) willingness to participate in the investigation. Elderly people living in Maués riparian communities far from the urban center and bedridden/immobilized individuals were excluded from the study.

As reported by Maia-Ribeiro et al. (10), all elderly subjects that took part in this study had easy access to the FHP. The provision of universal, integral, and equal access to health services for all Brazilians through the FHP was established by the Brazilian National Health System in 2010.

The study included older people in satisfactory physical condition who were

FIGURE 1. Physically challenging daily activities of riparian elderly (clockwise): 1) moving from one community to another in small boats, 2) walking down stairs with no handrail, 3) walking on uneven ground while working in the forest, and 4) walking down steep, unpaved inclines to bathe in river or perform other routine activities, Maués, Amazonas, Brazil, 2009–2014

Source: Supplied by the authors.

either current residents of the study site (the urban center of Maués City) or agreed to move there, upon their acceptance in the investigation based on the other inclusion criteria, for the duration of the study. In the initial (2009) investigation, along with fitness evaluation data, information related to socio-demographic, lifestyle, health, anthropometric, physiological, and biochemical biomarkers was collected from the study participants via a structured interview and complementary tests, as described by Maia-Ribeiro et al. (10). The data collection was coordinated and performed by physicians, nurses, physiotherapists, physical educators, social assistants, biologists, and additional personnel previously trained in collecting data and performing the pertinent tests.

Prior to commencing the study, approval was obtained from the ethics committee board of the Universidade do Estado do Amazonas (UEA) (Manaus). As the majority of the elderly in the study sample were illiterate, oral consent or fingerprinting was obtained to confirm their voluntary participation. The information gathered in this investigation was stored in a databank to guarantee participant anonymity.

Collection of mortality data

A five-year prospective follow-up study was performed to evaluate the survival rate of the population studied at baseline. Official death records (dates and specific causes of death) for all deceased participants were obtained from the Maués Municipal Health Department registry. Monitoring of the number of deaths in the study sample, which was computed monthly, showed a maximum survival period of 66 months (5.5 years) after the commencement of the 2009 study and a minimum of one month. The causes of death were also documented, following the criteria of the International Classification of Diseases (ICD-10) used by World Health Organization (WHO) member states.

Physical performance measurements at baseline

The cross-sectional investigation performed by Maia-Ribeiro et al. (10) included the administration of a senior fitness test consisting of assays designed to evaluate specific components of functional fitness (4), namely 1) the "chair-stand" test, measuring muscle strength of the lower body; 2) the "arm curl" test, measuring upper-body strength; 3) the "2-minute step" test, evaluating cardiorespiratory fitness; 4) the "chair sit-and-reach" test, assessing lower-body flexibility; 5) the "back scratch" test, measuring upper-body flexibility; 6) the Timed Up and Go (TUG) test, used to evaluate agility and balance; and 7) the Berg balance test (11).

This study evaluated the impact of three functional fitness tests in predicting elderly mortality at five-year follow-up: 1) the "2-minute step" test, which evaluated cardiorespiratory fitness; 2) the TUG test, which evaluated agility and balance; and 3) the "chair-stand" test, which measured muscle strength for the lower body. The potential impact of handgrip strength on mortality was also evaluated based on previous investigations that described this association, as reported in a meta-analysis performed by Cooper et al. (12).

Covariates

The potential influence of modifying variables in the association between physical performance analysis and mortality risk was also investigated by using information collected via a structured interview and physical and biochemical evaluations. The following modifying variables were analyzed: demographic variables (education, income, marital status, occupation); lifestyle characteristics (smoking habit); cardiovascular risk factors (hypertension, type 2 diabetes, obesity, dyslipidemia, metabolic syndrome); history of previous chronic diseases (including cardiovascular comorbidities and hospitalization in the last year); and use and quantity of daily medication. Anthropometric parameters and systemic blood pressure at baseline were also treated as modifying variables.

Statistical analysis

All statistical analyses were performed using SPSS-PC (Statistical Package for the Social Sciences on Personal Computers) version 19.0 (SPSS Inc., Chicago, Illinois, United States). The potential association among three physical performance test outcomes and mortality during the 66-month follow-up period was also evaluated. To perform this analysis, the demographic, lifestyle, health, physical, and biochemical parameters pertaining to the two groups of study participants (living and deceased) were compared to identify variables that could influence the association between the physical performance test outcomes and mortality risk. Similar analysis was conducted by comparing the mean scores of the physical performance tests between the two groups. The data were expressed as means and standard deviations (SDs) (for normally distributed variables) and proportions and percentages (for categorical variables). Associations between pairs of categorical variables were analyzed using the chi-squared test. Normally distributed continuous variables were analyzed using the Student's *t*-test, which was applied to independent groups. From the results these analyses yielded, the percentile distribution of physical performance test scores that were significantly different for the living versus the deceased group was determined, allowing for determination of the best cutoff value and classification of all study participants into categorical groups.

Kaplan-Meier survival curves were plotted to depict the effect of the dichotomized physical performance variables on mortality. Separate univariate and multiple proportional hazard models were fitted for each of the performance measurements while controlling for significant predictors. The final model included all performance measurements that were significant at the 5% level while controlling for significant covariates. The potential effect of modifying variables (sex, age, chronic disease, polypharmacy (the use of four or more medications), socioeconomic and cultural factors, lifestyle characteristics, and self-rated health) on the results was determined using logistic regression (backward Wald method). In all analyses, $P \leq 0.05$ indicated statistically significant differences in the results for the living versus the deceased group.

RESULTS

During the 5.5-year follow-up study period, 80 (12.7%) of the study participants had died, of whom 41 were male (14.1%) and 39 were female (11.5%). The deaths occurred 1–66 months after the baseline

assessment (60.25 ± 15.09 months). The mortality frequency did not differ by sex ($P = 0.031$).

The cause of mortality was categorized into major disease groups. The death records revealed that of the 80 elderly who died during the 5.5-year follow-up period, 10 died from cardiovascular morbidities (ICD-10 codes I64, I110, I249, I500, I639). The most prevalent cardiovascular cause was stroke (I64), diagnosed in five study participants. Three study participants died from lung disease (A162 (tuberculosis), J159/J189 (pneumonia), and J960 (respiratory failure)); two from renal failure (N19); and another two from gastrointestinal disorders (K171 and K567). One study participant died due to diabetes complications (E142), and in another case, senility was given as cause of death (R54). Most study participants (62 or 77.5%) died without medical assistance (R98). Therefore, due to the large heterogeneity of diagnostic causes of death and large number of study participants without specific diagnostic causes, it was not possible to accurately determine the association between causes of mortality and physical performance test scores.

The comparison of the baseline characteristics for the living and deceased study participants is presented in Table 1. As expected, the mean age at baseline was significantly higher in the group that had passed away during the follow-up period. However, values pertaining to other anthropometric, physiological, and biochemical variables were similar for both groups. Health indicators for the living and deceased were also compared and no significant differences were observed (Table 2).

The data from the comparison of the physical performance test results for the living and deceased study participants are shown in Table 3. As shown, the scores for lower-limb strength were slightly higher in the deceased group, but the differences were not statistically significant. Higher TUG test scores (indicating more time required to complete the mobility test, or a higher degree of frailty) were observed in the deceased group versus the living group, and these differences were statistically significant. The other tests, including an evaluation of handgrip strength, yielded similar results for both the living and deceased.

Calculation of the distribution of TUG test scores showed that 17 study participants (2.7%) had scores higher than 20 seconds, 146 (23.2%) scored between 11 and 19 seconds, and 465 (73.8%) scored ≤ 10 seconds. Significant differences were found between the living and deceased groups, with higher frequency of scores > 20 seconds in the deceased group (5%) compared to the living group (2.4%) ($P = 0.033$).

Given the low proportion of study participants with low TUG test scores (> 20 seconds), the percentile distribution was calculated and the study sample categorized into two different groups (those who scored < 14 seconds and those who scored ≥ 14 seconds), using the 75th percentile as the cutoff point.

Kaplan-Meier regression analysis confirmed an association between TUG test scores and risk of mortality (Figure 2). Given that age could be an important modifying variable in the association between those two variables, a second, separate but complementary analysis was performed comparing younger (< 75 years old) versus older (≥ 75 years old) individuals. The results of the second analysis confirmed that the association between TUG test scores and mortality was independent of age.

A multivariate analysis was also performed to evaluate other variables that could affect the association between the TUG test scores and mortality risk. The logistic regression showed that the association between these two variables was independent of previous history of metabolic syndrome, obesity, hypertension, diabetes type 2, cardiovascular disease, and other chronic morbidities, including musculoskeletal disorder, smoking habit, hospitalization in the six months prior to the baseline assessment, and daily medication intake. Therefore, before the corrections of these variables, the relative risk (RR) of dying in the 66-month period preceding the follow-up study for study participants with a TUG test score ≥ 14 seconds was higher than that for study participants with TUG scores < 14 seconds.

TABLE 1. Baseline characteristics of riparian elderly alive and deceased after 5.5 years of follow-up, Maués, Amazonas, Brazil, 2009–2014

Variable	Alive (mean ± SD[a])	Deceased (mean ± SD)	P[b]
Age (years)	71.81 ± 7.8	75.55 ± 8.8	< 0.001
Body mass index (kg/m^2)	25.22 ± 4.8	25.49 ± 4.1	0.642
Fat (%)	28.54 ± 6.3	28.53 ± 5.5	0.998
Body circumferences	88.02 ± 14.9	89.74 ± 10.4	0.321
Waist / hip ratio	0.98 ± 0.52	0.97 ± 0.31	0.908
Subcutaneous fat[c]	1.37 ± 0.57	1.36 ± 0.48	0.977
SBP[d] (mmHg)	129.58 ± 27.1	126.32 ± 30.8	0.325
DBP[e] (mmHg)	73.01 ± 14.2	73.56 ± 17.6	0.754
Glucose (mg/dL)	122.97 ± 50.1	117.74 ± 36.9	0.372
Cholesterol (mg/dL)	206.03 ± 51.6	208.91 ± 60.2	0.676
Triglycerides (mg/dL)	164.75 ± 95.6	163.50 ± 106.7	0.922
LDL[f] cholesterol (mg/dL)	140.99 ± 49.5	143.22 ± 50.5	0.740
HDL[g] cholesterol (mg/dL)	71.10 ± 17.9	71.95 ± 16.8	0.741
Uric acid (mg/dL)	4.85 ± 3.6	5.80 ± 5.8	0.107
Daily medicines (number)	2.35 ± 1.3	2.06 ± 1.3	0.476

Source: Prepared by the authors based on the study results.
[a] SD: standard deviation.
[b] Based on Student's *t*-test.
[c] Scapular/triceps.
[d] SBP: systolic blood pressure.
[e] DBP: diastolic blood pressure.
[f] LDL: low-density lipoprotein.
[g] HDL: high-density lipoprotein.

DISCUSSION

This study aimed to establish the potential association between physical performance scores and the risk of mortality in a cohort of Amazon riparian elderly. The results showed that TUG test scores predict 5.5-year mortality independent of age, sex, and other potential health and biological modifying variables. To the best of the authors' knowledge, this is the first longitudinal study that investigated the association between physical performance markers and the risk of mortality

TABLE 2. Health and lifestyle indicators for riparian elderly alive and deceased after 5.5 years of follow-up, Maués, Amazonas, Brazil, 2009–2014

Variable	Alive No. (%)	Deceased No. (%)	*P*[a]
Obesity	50 (9.1)	10 (12.5)	0.332
HBP[b]	258 (46.9)	35 (43.8)	0.597
Diabetes type 2	70 (12.7)	09 (11.3	0.709
Metabolic syndrome	71 (12.9)	15 (18.8)	0.155
Cardiovascular diseases	36 (6.5)	6 (7.5)	0.749
Chronic morbidity	441 (80.2)	63 (78.8)	0.765
Hospitalizations	78 (14.3)	10 (12.5)	0.668
Daily intake of medication	270 (49.1)	40 (50.0)	0.879
Fall	136 (24.7)	19 (23.8)	0.850
Smoking habit	63 (11.5)	12 (15.0)	0.360
Regular physical activity	40 (50.0)	320 (58.2)	0.160

Source: Prepared by the authors based on the study results.
[a] Based on the chi-squared test.
[b] HBP: high blood pressure.

TABLE 3. Functional indicators for riparian elderly alive and deceased after 5.5 years of follow-up, Maués, Amazonas, Brazil, 2009–2014

Variable	Alive (mean ± SD[a])	Deceased (mean ± SD)	*P*[b]
Handgrip strength (kg[c])			
Right hand	20.94 ± 7.1	21.23 ± 7.3	0.734
Left hand	20.77 ± 7.0	20.65 ± 7.6	0.889
TUG[d] test (seconds required for completion)	9.44 ± 3.5	10.50 ± 4.6	0.019
Aerobic capacity (no. of repetitions)	86.07 ± 21.6	84.17 ± 21.8	0.497
Lower-limb strength (no. of repetitions)	17.20 ± 5.6	18.92 ± 9.7	0.067
Upper-limb strength (no. of repetitions)	12.64 ± 6.5	11.97 ± 6.2	0.411

Source: Prepared by the authors based on the study results.
[a] SD: standard deviation
[b] Based on Student's *t*-test.
[c] Measured with a dynamometer.
[d] TUG: Timed Up and Go (mobility test).

in elderly living in environmentally and socially adverse conditions. The results reported here corroborate those obtained in previous investigations that also linked physical performance aspects with the risk of mortality in elderly living in developed countries (1, 8, 13).

The TUG test measures basic mobility skills, including a sequence of functional activities performed in everyday life (14, 15). This physical performance test is considered reliable and valid for quantifying functional mobility. Administration of the TUG test is quick, inexpensive, and requires no special equipment or training (16). The unit score yielded by the TUG test is the time that it takes for the study participant to rise from a chair, walk 3 m, turn around, walk back to the chair, and sit down. Some research studies consider a score of 10 seconds or less an indicator of normal mobility and those of 11–20 seconds as within the normal limits for frail elderly. Scores of > 20 seconds suggest that the person is fragile and has a greater risk of falling (17).

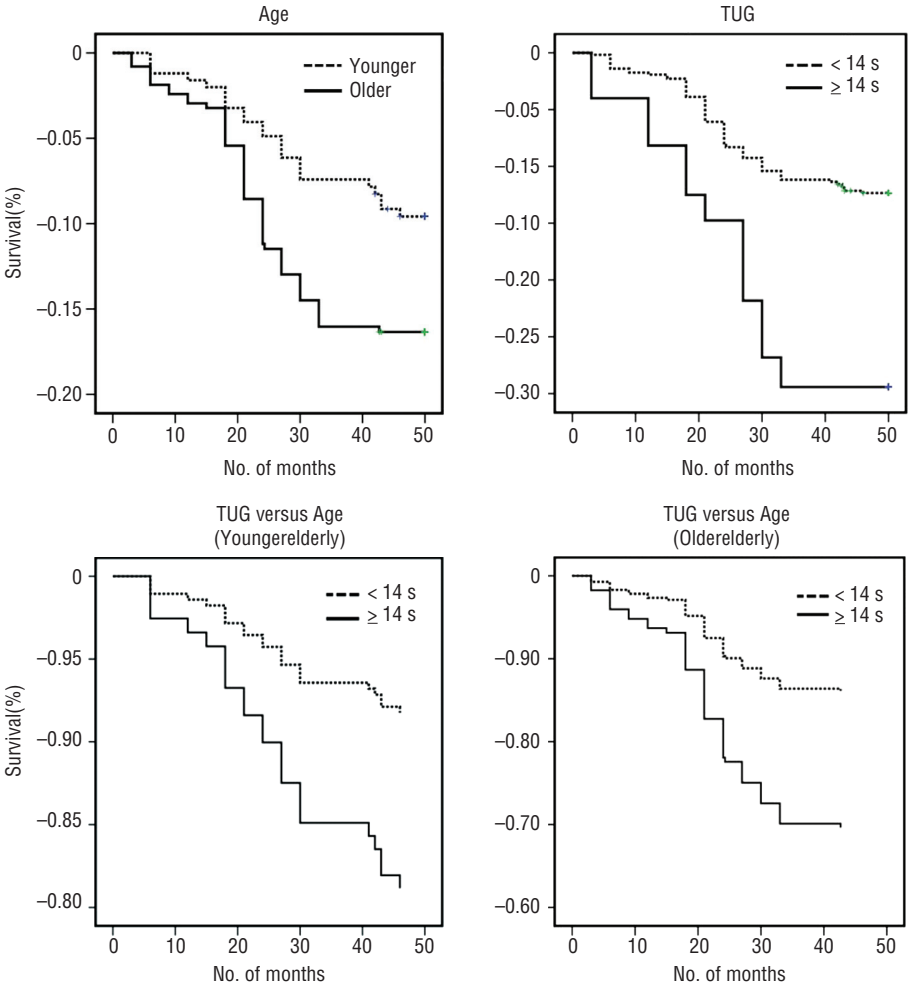
In the riparian elderly sample investigated in the research reported here, the number of individuals that required more than 20 seconds to complete the TUG test was relatively low. Although the TUG test has been used extensively, normative reference values from large samples of senior subjects have not been published or consolidated. A descriptive meta-analysis performed by Bohannon (18) that included 4 395 individuals that took part in 21 studies suggested that the mean time for completing the TUG test is 9.4 seconds (95% confidence interval (CI): 8.9–9.9 seconds) for elderly aged 60–99 years. Results for the living riparian elderly in the research reported here had a similar mean score (9.44 ± 3.5 seconds). Bohannon's analysis also suggested that mean TUG test scores are weaker than average if they exceed 9.0 seconds for those aged 60–69 years, 10.2 seconds for those 70–79 years, and 12.7 seconds for those 80–99 years. In the research reported here, the mean age of the deceased study participants was 75.5 ± 8.8 years and their mean TUG test score was 10.5 ± 4.6 seconds—slightly higher than the results noted by Bohannon (18).

Based on their study of community-dwelling (versus institutionalized) elderly 65–85 years old, Bischoff et al. (14) proposed a TUG test score cutoff point of 12 seconds or less. The mean TUG test scores for the riparian elderly studied in the research reported here are within that range. Two studies by Idland et al. examined the association between mean TUG scores and morbidity and 13.5-month mortality in Scandinavian elderly women (8, 9). Compared with the data from those two studies, the mean TUG test scores for the living and deceased groups in the current research were higher. The Scandinavian research reported a mean TUG test score of 6.0 seconds (± 1.3) and 8.3 seconds (± 3.3) for living and deceased groups respectively (8), indicating that the elderly in that study had a better physical performance overall compared to the Brazilian riparian subjects investigated here. These differences may be attributable to better socioeconomic conditions and specialized health services available to elderly that reside in developed countries compared to those living in environmentally and socially adverse conditions in developing countries.

The relative mortality risk associated with TUG test scores has also been estimated in several extant prospective investigations. One such study was performed in Belgium and included 353 older men who were followed up for more than 15 years. The authors found a significant association between TUG test scores and mortality, irrespective of the cause. Adjusted RR was 1.58 (CI: 1.40–1.79) for global mortality (13). Although statistically significant, this RR value was lower than the one found in the current study (> 2.8). Again, socioeconomic conditions and health service access are the likely cause of this discrepancy.

De Buyser et al. (13) also found an association between TUG test scores and mortality due to cardiovascular diseases. This association was also described by Donoghue et al. (19), who studied 4 525 elderly in The Irish LongituDinal Study on Ageing (TILDA). Their results showed a significant association between high TUG test scores and arterial fibrillation.

FIGURE 2. Kaplan-Meier survival curves for mortality in riparian elderly by age (< 75 years, ≥ 75 years) and Timed Up and Go (TUG)a score (< 14 seconds, ≥ 14 secondsa) and the interaction between the two variables, Maués, Amazonas, Brazil, 2009–2014



Source: Prepared by the authors based on the study results.
[a] Age did not influence the association between higher mortality and TUG (mobility test) scores > 14 seconds.

Limitations

The main methodological limitation of this study stems from the fact that most of the study participants died without medical assistance and therefore it was not possible to determine the association between mortality causes and TUG test scores. The other study limitation pertains to logistics, including difficulties in accessing the elderly riparian study sample and the high economic cost of performing the analysis, which precluded a second round of data collection of biological and health variables.

Conclusions

The results reported here showed that the TUG test, a modifiable physical performance–based measurement, is a reliable five-year mortality predictor in the Maués' riparian elderly cohort. These results corroborate the hypothesis that disability evaluated by aspects of physical performance, such as those included in the TUG test, is more predictive of mortality among older people than multi-morbidity. In addition, these results indicate that maintenance of both agility and balance has a universal impact on the risk of mortality in the elderly population, independent of sex, age, socioeconomic status, previous morbidity history, and access to health services.

Based on the results described here, the authors recommend the use of the easy-to-administer and inexpensive TUG test as a means of identifying elderly people with a higher relative risk of mortality. TUG test scores can also be used as an indicator for initiating therapeutic and preventive actions in the elderly, including conducting exercises or physical activities adapted to the health and functional conditions of that cohort.

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Conflicts of interest. None.

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RESUMEN

Influencia de los determinantes de la capacidad funcional sobre la mortalidad a 5,5 años de los ancianos de las zonas ribereñas del Amazonas

Objetivo. Evaluar si los parámetros modificables del rendimiento físico permiten predecir la mortalidad a 5,5 años en una cohorte de ancianos de las zonas ribereñas de la selva tropical del Amazonas.

Métodos. En este estudio longitudinal se evaluó la influencia de los determinantes de la capacidad funcional sobre la mortalidad a 5,5 años en una cohorte de ancianos de la ciudad ribereña de Maués del estado de Amazonas (Brasil). El estudio consistió en un seguimiento de una investigación observacional anterior en la que se efectuaron diversas pruebas para determinar el estado físico de 630 ancianos de las zonas ribereñas del Amazonas (291 hombres y 339 mujeres) de 72,3 años de edad ± 8,0 (60-99) años. La cohorte fue seleccionada en función de las condiciones ambientales adversas, que aumentan el riesgo de caídas pero exigen un buen estado físico para llevar adelante las actividades relativamente rigurosas de la vida cotidiana, así como del acceso limitado a servicios de salud especializados. Los certificados de defunción oficiales se obtuvieron del Ministerio de Salud del Municipio de Maués.

Resultados. En el transcurso del estudio, que tuvo una duración de 5,5 años, fallecieron 80 participantes (12,7 %). El análisis de regresión de Kaplan-Meier reveló una relación significativa entre los valores de la prueba cronometrada de levantarse y caminar (TUG) ≥ 14 segundos y el riesgo de mortalidad, que fue independiente del sexo, la edad y demás variables de salud.

Conclusiones. Los resultados de este estudio indican que la prueba TUG puede emplearse como indicador de la necesidad de instituir medidas terapéuticas y preventivas, como ejercicios o actividades físicas adaptadas a la salud y el estado funcional de los ancianos, dado que permite detectar a aquellos que están expuestos a un riesgo relativo de muerte más alto.

Palabras clave Mortalidad; riesgo; anciano; Brasil; Américas.