

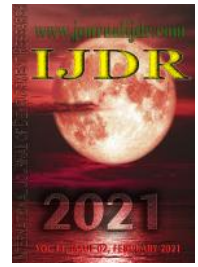


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RESEARCH ARTICLE

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## ASSOCIATION BETWEEN PER CAPITA INCOME AND SUPINE TO STAND TASK PERFORMANCE IN OLDER ADULTS

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### ABSTRACT

**Introduction:** Socioeconomic status influences on Brazilian elderly population, as well as the morphological and functional repercussions derived from the aging process are increasingly taking place in interdisciplinary sphere of studies related to gerontology. The associations of variables from human domains amplify the discussion in the field of health sciences and exact sciences. Therefore, the objective of this study was to associate per capita income and supine-to-stand task performance in the elderly. The sample consisted of 170 elderly people, free of dementia or any metabolic, cardiac or osteoarticular disease that prevented them from performing supine-to-stand task, without assistance. Per capita income was collected through a questionnaire and the motor task was filmed and analyzed by computational software to determine the time required to perform the movement. The reliability of the filming decoding was calculated from the Intra-Class Correlation Index ( $r = 0.99$ ;  $p < 0.001$ ). The association between the variables were calculated using the Qui-Square test and the significance level adopted was  $p = 0.05$ . The correlation between supine-to-stand task performance and per capita income was negligible ( $p = 0.580$ ) and did not reach statistical significance. The main results suggested that the motor competence screening must be executed independently of per capita income

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## INTRODUCTION

The association between human domains variables extended the horizon of discussion on health and exact sciences (1). Especially, the influences of older adult's socioeconomic status, as well as, aging process morphofunctional repercussions are increasingly taking place in the interdisciplinary gerontology studies (1–5). Therefore, it has become increasingly common to understand the profound transformations originated by demographic transition have been altered human interaction and intergenerational communication forms (6,7). As never seen before in the modern history of Brazil, the frequency of families becoming economically dependent on the elderly is increasing due to the financial resources of the retirement from the local public policy. So, the paradigm regarding the aging process is pointed as imperative in order to support political, economic and social adaptations, even though in an epidemiological perspective, longevity is considered a victory for human history,

worthy of celebration. On the other hand, the reach of older ages is innocuous and infertile if not used lucidly and productively, that is, quantity and quality of life must go hand in hand throughout this journey. In this way, experts advocate policies that provide for healthy aging should be based on three main factors: i) increase and maintenance of physical and cognitive capacity, ii) a decrease in the likelihood of illness and iii) active engagement with social life (2,7). Specifically, indicators of socioeconomic status are associated with health and quality of life among the elderly (8–10). For example, higher prevalence of functional disability among elderly women was associated with over 80 years of age, whites, widows, lived alone and which belongs to the lower social classes (5,9). Besides that, socioeconomic level measures depend on a set of factors such as educational level, wealth, occupation, and income of individuals (11). Among these measurements, the most used is the per capita income, defined as total household income divided by a total number of residents (12). Generally, it is collected through questionnaires about the salary, employment, how many people live in the same residence

and even the environment that these elderly people attend and this way used as a dependent variable has proved to be practical and feasible in the investigation of socioeconomic status. Other possibility is to investigate this socioeconomic variable through governmental census. Some inconsistencies were founded when used both methods to evaluate the associations between household per capita income and functional physical performance (4). In the scope of manifestation of the motor skills necessary to maintain the capacity to carry out activities of daily living, the Supine-To-Stand (STS) task emerges like the most important screening measure because its motor competence nature, able to combine physical fitness evaluation, postural righting task and motor coordination performance, contained in typical human movement repertoire through the lifespan(13–20). STS performance was associated with physical activity level and risk of morbidity(21). So, it can be expected that who is able to perform this task well, have better physical-functional and health conditions. Therefore, an analysis of the functional motor competence provided by STS task performance combined with the per capita income allows a more comprehensive understanding of the aging process manifestation in different human domains. This characteristic is sensitive and accessible to several professionals in the area of health and sciences. Thus, considering that the functional performance of the elderly and their living conditions must be closely related(1,3), the present study aimed to investigate the association between per capita income and the performance of the STS task. The hypothesis of this study is that the higher per capita income should be positively associated with better performance in the STS task.

## MATERIALS AND METHODS

**Description of the sample:** This is a quantitative, descriptive and cross-sectional study (22) of motor competence and per capita income of the elderly, approved by a Brazilian local Ethics and Research Committee on Human Subjects. A convenience sample resident in Distrito Federal (the Brazil' capital), signed a free and informed consent form and was composed of 170 volunteers ( 60 years old), free of dementia or any metabolic, cardiac or osteomioarticular disease that would prevent them from performing the STS without assistance.

Distrito Federal is composed by 33 administrative regions and the sample of this investigation lived in 49% of this. the local population is estimated at more than 326.000 older adults ( 60 years old)(23). Individual per capita income was determined by the per capita income of the administrative region in which the individual lives. A blinding process was carried out between the evaluators who collected the socioeconomic and STS data, as well as between the evaluators who participated in the data collection and the statistical evaluators. The volunteers answered a questionnaire that consists of several questions of characterization of the sample and related to per capita income (administrative region where the volunteer resides). Finally, the volunteers then performed the STS task described as follows. Time-constrained supine-to-stand (STS) task evaluation protocol proposed by Cattuzzo et al.(20).

**Statistical Analysis:** Descriptive data were shown by absolute and relative frequency (%), mean and median as measures of central tendency, as well as standard deviation and interquartile range, as dispersion measures, respectively. The reliability of the filming decoding was calculated from the Intra-Class Correlation Index ( $r = 0.99$ ;  $p < 0.001$ )(24). The association were determined using the Qui-Square Test to investigate de independence degree. The tertiles related to per capita income and performance in the STS task for the appropriate associations were identified. The level of significance adopted was  $p = 0.05$ (25).

## RESULTS

In the sample composed of 170 elderly, the majority were female ( $n = 122$ ), aged between 60 and 90 years. The largest frequency of the elderly was classified as normal and overweight (Table 1). The Brazilian minimum wage started to be worth US\$ 205.12 as of January 1, 2021. This means that of the sample evaluated, 34% had per capita income below the minimum wage. The tertiles founded for per capita income and STS performance were, respectively: < US\$ 185,90, US\$ 185,90 - US\$ 1139,79, > US\$ 1139,79 and > 6,79s, 6,79s – 3,58s, < 3,58.

**Table 1. Sample's descriptive data (n = 170; mean  $\pm$  standard deviation)**

Per Capita Income (US\$)	584,92 $\pm$ 494,94
Gender: Male ; Female (%)	28 ; 72
Age (years)	69.0 $\pm$ 6.2
Body Mass (kg)	68.6 $\pm$ 13.2
Height (m)	1.59 $\pm$ 0.09
Body Mass Index (kg/m <sup>2</sup> )	26.9 $\pm$ 4.2
Low Weight (%)	10
Suitable Weight (%)	45
Overweight (%)	45
STS (s)	5.97 $\pm$ 3.94

US\$ = American dollars; kg = kilograms; m = meters; STS = Supine-To-Stand; s = seconds.

**Table 2. Cross-Tabulation of Per Capita Income Categories x STS (performance categories by tertiles)**

		STS			Total	
		Worst	Median	Best		
Per Capita Income	Poorest	N	14	19	13	46
		% in Per Capita Income Categories	30.4%	41.3%	28.3%	100,0%
		% in STS (performance categories by tertiles)	33.3%	22.1%	31.0%	27.1%
		% of total	8.2%	11.2%	7.6%	27.1%
	Median Income	N	16	38	14	68
		% in Per Capita Income Categories	23.5%	55.9%	20.6%	100,0%
		% in STS (performance categories by tertiles)	38.1%	44.2%	33.3%	40,0%
		% of total	9.4%	22.4%	8.2%	40,0%
	Richer	N	12	29	15	56
		% in Per Capita Income Categories	21.4%	51.8%	26.8%	100,0%
		% in STS (performance categories by tertiles)	28.6%	33.7%	35.7%	32,9%
		% of total	7.1%	17.1%	8.8%	32,9%
Total		N	42	86	42	170
		% in Per Capita Income Categories	24,7%	50.6%	24.7%	100.0%
		% in STS (performance categories by tertiles)	100,0%	100.0%	100.0%	100.0%
		% of total	24,7%	50.6%	24.7%	100.0%

STS = Supine-To-Stand.

The STS task performance show a range of 2.06s to 26.74s. Table 2 shows the cross-tabulation between per capita income categories and STS performance categories by tertiles. The results of Qui-square identify a value of  $p = 0,580$ .

## DISCUSSION

The objective of this study was to verify the influence of per capita income on the STS task performance of the elderly. The main finding was that the association between STS performance and per capita income was negligible and not significant., this is, the dependence degree between the variables is not significant. Intra-group analysis of per capita income showed that almost three-quarters of the sample (73%) had the per capita income concentrated in the median and richest categories, corresponding about one to six minimum Brazilian wages. According to data from the Brazilian Institute of Applied Economic Research (IPEA) (23,26), Distrito Federal (location of this survey), has the biggest per capita income of Brazil. Moreover, considering greater accessibility to services and knowledge, higher income results in positive impacts on the physical and functional motor competence of individuals, or in other words, disability is less prevalent in the richer samples (1,2,5). However, despite the apparent disagreement with the results of the literature, some considerations should be pointed out as the lowest level of association between disability and poverty in older adults' studies, when analyzed by age groups. In a recent systematic review, despite the higher frequency of positive associations between poverty and disability, the older adult's group had more null and negative associations than all other age groups (2)(2). Besides that, Hirai *et al.* showed that the strength of correlations became weaker and lost statistical significance when in a survey analysis were included a sample that responded to questions about income by mail (4). Finally, the possible occurrence of publication bias could result in overestimation of the association between socioeconomic and functional/physical/health performance. However, the most important information that stands out is that, for this sample, the STS task performance was not associated with their per capita income, leading us to reject the hypothesis of the study. The possible explanation for this is that this sample seems to portray a group that, regardless of their income, maintains their physical and functional motor competence through a healthy lifestyle. But the controversy remains about the importance of personal income to the health of the elderly.

Moreover, in the face of the controversy, elderly residents in a nursing home of high socioeconomic status presented a worse performance in the STS task compared to the sample of the present study. Although the author did not analyze the per capita income, there was a significant difference in the time spent to perform the test, which was 20 to 27 seconds (13). Another study showed a threefold better performance on STS task in the independent elderly compared to the dependent ones (25). So, the level of functional dependence of the elderly also emerges as a factor to be controlled and better investigated, as soon as, its relationship with the socioeconomic status. Body composition variables also deserve attention in future investigations. In the present study, this variable was promising in terms of absolute frequency of overweight elderly and, although showed weak correlation levels, demonstrates that these factors can contribute partially for the STS performance corroborating

with other studies (17,27). Apparently, the higher frequency of elderly women was associated with lower stature in the group with lower income per capita. Even so, the STS task performance of the present study sample was approximately 50% better than Ulbrich *et al.* (2000) study (27). Due to the high frequency of women in this sample (72%), the gender factor also earned a note and speculation. An inverse association was founded between household income per capita and functional performance decline (3). But, in other study, disability was 1.5 times more frequent in women (5). In Brazil, in population terms, the elderly women are also the majority (62.4%). The number of elderly women people responsible for their homes is increasing. Across the country, 64.7% of them live with sons and/or daughters and/or other relatives in the same house. In households where the elderly is responsible, the most common form of the family organization is without the spouse (93.3%), because in these cases, probably, such households are occupied by the elderly widows. Among specialists in gerontology, there are some justifications for this behavior as the life expectancy of women, which is generally higher, since there are public policies aimed, in particular, at women and thus leading to greater care. The low rate of violent deaths among women aged 15-30 years also seems to be a determining factor that allows women to greater opportunities related to longevity. Therefore, a more specific look at the sex factor certainly makes it purerto identify the nature of the relationship between the functional and socioeconomic performance of the elderly (9,26). Finally, it was concluded that, based on the understanding that STS task performance is a valid, easy, practical strategy to evaluate the functional motor competence of the elderly and especially because its characteristic of belonging in the typical human repertoire of movements (14,20), the main results suggested that this motor competence screening test must be executed independently of per capita income. Furthermore, it's necessary to recognize some limitations of this study as the sampling technique for extrapolation results. Future investigations must propose reflections about other socioeconomic variables influence due to the wide range of tools used to measure both functional, physical and health performance and socioeconomic variables. The present study did not count on the financial support of any nature for its accomplishment. The authors declare no conflicts of interest.

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