



Physical activity patterns and functional performance among low-income older adults

Padrões de atividade física e desempenho funcional entre pessoas idosas de baixa renda

AUTHORS

Isabella Pereira Rico¹
Marisa Silvana Zazzetta¹
Aline Cristina Martins Gratão¹
Ariene Angelini dos Santos-Orlandi²
Carla Manuela Crispim Nascimento²
Fabiana de Souza Orlandi¹
Henrique Pott Junior¹
Isabela Thaís Machado de Jesus¹
Karina Gramani-Say¹
Letícia Pimenta Costa Guarisco¹
Paula Costa Castro¹
Sofia Cristina Iost Pavarini¹
Grace Angélica de Oliveira Gomes¹

1 Universidade Federal de São Carlos,
Departamento de Gerontologia, São Carlos, São
Paulo, Brasil.

2 Baylor University, Departamento de Saúde,
Desempenho Humano e Recreação,
Dallas, Texas, Estados Unidos da América.

3 Universidade Federal de São Carlos,
Departamento de Enfermagem, São Carlos, São
Paulo, Brasil.

CORRESPONDING

Grace Angélica de Oliveira Gomes

grace@ufscar.com

Rod. Washington Luís, km. 235 (SP-310 -
São Carlos), São Carlos, São Paulo, Brazil.
Zip code: 13565-905.

DOI

10.12820/rbafs.31e0450i



This work is licensed under a [Creative Commons
Attribution 4.0 International License](https://creativecommons.org/licenses/by/4.0/).

Copyright© 2026 Isabella Pereira Rico, Mari-
sa Silvana Zazzetta, Aline Cristina Martins
Gratão, Ariene Angelini dos Santos Orlandi,
Carla Manuela Crispim Nascimento, Fabiana
de Souza Orlandi, Henrique Pott Junior, Isa-
bela Thaís Machado de Jesus, Karina Grama-
ni-Say, Letícia Pimenta Costa Guarisco, Paula
Costa Castro, Sofia Cristina Iost Pavarini,
Grace Angélica de Oliveira Gomes.

ABSTRACT

Introduction: Physical inactivity may be associated with lower levels of functional independence; however, this relationship is not fully yet understood among low-income older adults. **Objective:** To analyze the association between physical activity (PA) trajectories and functional independence in low-income older adults over a three-year period. **Methods:** This was a longitudinal and prospective study including older adults registered at primary healthcare units located in a socioeconomically vulnerable area. Sociodemographic data, PA levels, and functional independence in basic (BADL), instrumental (IADL), and advanced activities of daily living (AADL) were assessed using the Katz Index, Lawton and Brody scale, and Reuben and Solomon scale, respectively. Data collection was conducted at participants' homes by previously trained evaluators, following all ethical standards for research involving human subjects. Crude and adjusted logistic regression analyses were performed to assess associations, considering $p < 0.05$. **Results:** Among the 223 older adults (mean age: 72.6 ± 7.1 years), 48.7% were classified as insufficiently active in 2015, increasing to 55.6% in 2018. A desirable PA trajectory (participants who were active in both 2015 and 2018, or those who transitioned from insufficiently active in 2015 to active in 2018) was associated with better functional independence in BADLs (OR: 6.80; 95% CI: 1.45 – 31.79), IADLs (OR: 4.24; 95% CI: 2.24 – 8.05), and AADLs (OR: 4.42; 95% CI: 2.16 – 9.07). **Conclusion:** Being consistently active or presenting increasing PA levels over a three-year period was associated with a lower risk of functional decline in BADLs, IADLs, and AADLs, among low-income older adults.

Keywords: Motor activity; Physical functional performance; Healthy lifestyle; Aging.

RESUMO

Introdução: A inatividade física pode estar associada a piores níveis de independência funcional de pessoas idosas; no entanto, pouco se sabe sobre esta associação em pessoas de baixa renda. **Objetivo:** Analisar a associação entre trajetórias de atividade física (AF) e independência funcional de pessoas idosas de baixa renda por um período de três anos. **Métodos:** Este é um estudo longitudinal e prospectivo incluindo pessoas idosas cadastradas na Atenção Primária à Saúde de uma área de alta vulnerabilidade social. Por meio de questionários, foram mensurados dados sociodemográficos, nível de AF e independência funcional nas atividades básicas (ABVD), instrumentais (AIVD) e avançadas de vida diária (AAVD) por meio das escalas de Katz, Lawton e Brody, Reuben e Solomon, respectivamente. Análises de associação foram realizadas por meio de regressão logística bruta e ajustada, considerando $p \leq 0,05$. **Resultados:** De 223 pessoas idosas ($72,6 \pm 7,1$ anos), 48,7% eram insuficientemente ativas em 2015, enquanto em 2018, a proporção aumentou para 55,6%. A trajetória de AF desejável (pessoas ativas em 2015 e 2018; ou insuficientemente ativas em 2015 e ativas em 2018) foi associada a ter melhor independência funcional em ABVDs (OR = 6,80, IC 95%: 1,45 – 31,79), AIVDs (OR: 4,24, IC 95%: 2,24 – 8,05) e AAVDs (OR = 4,42, IC 95%: 2,16 – 9,07). **Conclusão:** Estar consistentemente ativa ou aumentar o nível de AF ao longo de três anos foi associado a um menor risco de pessoas idosas de baixa renda terem baixo desempenho funcional nas ABVDs, AIVDs e AAVDs.

Palavras-chave: Atividade motora; Desempenho funcional físico; Estilo de vida saudável; Envelhecimento.

Introduction

Low-income older adults are at a greater risk of frailty than their peers with higher incomes^{1,2}. The sociocultural environment is marked by structural inequalities, such as precarious housing, lack of accessibility, inadequate sanitation, food insecurity, unfavorable working conditions, and a lack of adequate spaces for leisure. Residents in highly vulnerable areas may also face greater difficulty accessing public health and social assistance services. Added to this are low levels of education, lack of social support, and functional literacy, which can hinder access to and the use of services, exacerbating situations of exclusion and inequality³. This framework can increase the risk of early illness, falls, and poorer performance in activities of daily living (ADLs)^{2,3}.

The ability to perform ADLs has been frequently highlighted in international documents and Brazilian public policies as a priority focus for promoting active and healthy aging, since a decline in functional performance significantly affects the daily lives of older people⁴. Therefore, strategies for maintaining and improving the functional capacity of older people are extremely important to minimize the harm associated with poverty^{3,4}. Promoting healthy lifestyle habits has been considered one of the essential strategies for this maintenance, especially in Primary Health Care^{3,4}.

In this sense, regular physical activity (PA) is a lifestyle habit that can prevent or delay functional disability^{5,6}. The physiological alterations caused by PA positively affect muscle strength and cognitive ability in older adults, which can consequently activate brain and motor areas responsible for functional performance⁶⁻⁸. Despite these widely known benefits, few people meet the PA recommendations for health, which indicate at least 150–300 minutes of moderate-intensity PA or 75 minutes of vigorous-intensity PA per week⁹. Adherence to these goals is limited, as well as which, the time individuals dedicate to PA fluctuates widely throughout their lives, due to individual, interpersonal, and environmental changes, or the occurrence of specific life events¹⁰.

Factors such as being male, having a higher level of education, and higher income or a better occupational position are associated with a greater likelihood of following a more physically active life trajectory¹¹. In addition, there are sharp declines in PA levels among young women with one or more children and individuals who work long hours per week. Conversely, as

individuals age and pass 50, and children leave home, PA levels increase¹². However, according to scientific literature, in old age, due to decreased work activity and increased health problems and individual beliefs, the level of PA may decrease again^{12,13}.

Therefore, it is important to understand the PA trajectories of older adults, especially those with low incomes, and the possible long-term consequences of fluctuations in PA behaviors throughout life on functional independence. Most existing studies on PA trajectories in older adults focused on associations with sociodemographic factors, depressive symptoms⁸, healthcare costs¹³, cognitive performance⁵ or were carried out primarily in developed countries^{6,14-17}, highlighting a gap in the scientific knowledge about ADLs. Although the scientific literature contains studies on the association between PA and functional performance, most studies did not originate from low-income contexts, analyzed only performance in basic activities of daily living, and, frequently, conducted cross-sectional analyses^{5,15}.

Considering that a decline in functional performance is an important marker of frailty in older adults, and that the practice of PA throughout life could be a strategy to mitigate losses related to old age and the context of poverty, the current study aims to analyze the association between PA trajectories and functional independence of low-income older adults over a period of three years. The results of this longitudinal study may contribute to improving the quality of care provided to older people, especially those living in poverty, in pursuit of equity in the comprehensive care of older adults.

Method

Study design and participants

This is a prospective cohort study conducted in a socially vulnerable area in the municipality of São Carlos, São Paulo, Brazil. Individuals aged 60 years or older, residing in the area classified as socially vulnerable in the municipality and registered in a Primary Health Care unit (and general practitioners) in the area were invited to participate in the study ($n = 852$). The study included older adults who accepted the invitation, with the exclusion of those who met the following criteria: were hospitalized or resided in long-term care facilities and obtained a score below the established threshold on the Mini-Mental State Examination test, based on a cutoff score according to: illiterate (13 points or more), 1 to 7 years of schooling (18 points or more),

and 8 or more years of schooling (26 points or more). Data collection occurred over the two years of this study. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist was used to report the study.

This study corresponds to a secondary analysis of data from two cohorts previously conducted in 2015 and 2018. For this reason, no a priori sample size calculation was performed for the specific hypotheses of this investigation. The analyzed sample included all eligible participants with complete data available at both data collection points, 2015 and 2018¹⁸, characterizing a census-based inclusion strategy from the existing database. This approach is compatible with prospective observational studies that use pre-established databases. The final number of participants allowed for the planned analyses to be conducted, maintaining an adequate ratio between the number of outcomes and the total number of variables included in the multivariate models, according to methodological recommendations for logistic regression. The final sample sizes for the first wave (2015) and the second wave (2018) were 345 and 223, respectively.

The interviewees were informed about signing the Informed Consent Form at the initial contact in their residence and were made aware of the research objectives, as well as the risks and benefits of participating in the study. The participants consented to the invitation and registration through the signing the Informed Consent Form. The study was approved by the Ethics Committee of the Federal University of São Carlos, according to protocol 860.653/2014.

Data collection

Data collection was conducted for nine months in each year, in the homes of the older participants, during the two years of collection, by previously interviewers. The interviewers were undergraduate and graduate students from the Gerontology Department of the Federal University of São Carlos. The training was offered at the Practical Simulation Unit of the Federal University of São Carlos. The home interview simulation was conducted with older participants. The training also included monitoring sessions to clarify doubts about data collection procedures and data collection instruments. The students were trained to act as recruiters and interviewers. In their role as recruiters, they sent invitations directly to the addresses registered on the lists of older people enrolled in the Family Health Units. If the

older adult agreed to participate, a home interview was scheduled to administer the study protocol. The field visits were organized according to a schedule of days and times. Acting as interviewers, the students applied the protocol in the homes of the older individuals. The interview lasted approximately 90 minutes, which was a challenging factor for data collection. When the older person was unable to answer the questionnaires, the caregivers answered on their behalf.

Instruments

To assess sociodemographic characteristics and health conditions, a questionnaire was applied that included the following questions: age range (60-69; 70-79; 80 or more), gender (female; male), education level (illiterate; 1-4 years; 5 years or more), race/ethnicity (white, black, brown, indigenous, Asian (amarelas), or no self-declaration provided), and whether they live alone (Yes; No).

Regarding ADLs, the following assessments were used:

- a) Basic Activities of Daily Living (BADLs): We used the BADL Independence Scale, developed by Katz et al.¹⁹ and adapted by Lino et al.²⁰ which assesses six areas: bathing, dressing, toileting, transferring, continence, and feeding. One point is assigned to each dependency domain^{20,21}. The result ranges from zero to six points, with zero points representing independence in all six functions and with the addition of one point for dependence per function, meaning that six points represent dependence in all six roles. The variables were dichotomized into: 1) Independent (for those who scored zero) and 2) Dependent (for those who scored one to six), as proposed by the authors of the scale.
- b) Instrumental Activities of Daily Living (IADLs): The Lawton Index instrument, developed by Lawton and Brody, was used²¹, adapted for Brazilian Portuguese. The reliability of the tool was evaluated by Dos Santos and Virtuoso in 2008²². This assessment comprises seven instrumental activities that include the ability to use a telephone, go shopping, prepare food, take care of the house, get around, manage finances, and take responsibility for one's own medication. The final score ranges from seven points (total dependence), > 7 and < 21 points (partial dependence), and 21 points (independence). The variables were dichotomized into: 1) Independent

and 2) Partially/Totally Dependent, for those who scored below 21, as proposed by the authors of the scale.

- c) Advanced Activities of Daily Living (AADL): The AADL scale developed by Reuben and Solomon²³ assesses four domains: work, leisure activities, travel, social participation, and participation in religious groups. The questions concern participation in educational, civic, religious, and leisure activities. Responses were categorized as: never did, stopped doing, and still does. The score was calculated using the total number of activities each participant reported doing. Those who performed four or more activities were considered more active, and those who reported performing up to three activities were considered less active. As proposed by the scale's authors, the variables were dichotomized into: 1) Active and 2) Slightly active.

To determine the level of PA, the International Physical Activity Questionnaire (IPAQ) – long version – was applied. This questionnaire presents validity and reproducibility similar to other instruments used internationally to measure PA levels²⁴. The IPAQ-long version is divided into four components: work-related PA, transportation-related PA, domestic PA, and leisure-related PA. The questions refer to PA in the previous week (previous seven days) and measure the number of days and time spent in moderate and vigorous activities in each component. This instrument has been previously validated in several countries and has been widely used throughout Brazil. Minutes of PA in each domain and total weekly PA minutes were analyzed. Following World Health Organization recommendations, individuals who reported 150 minutes or more of PA during the week were classified as active, while those who reported less than 150 minutes were classified as insufficiently active. The groups of desirable and undesirable PA behavior were divided according to the following criteria: a) desirable trajectory - older adults who remained active from 2015 to 2018 or increased their level of PA during that period; and b) undesirable trajectory - older adults who remained insufficiently active from 2015 to 2018 or decreased their level of PA during that period.

Finally, in the assessment of perception about PA, a multiple-choice question was used to establish whether older adults considered PA important and whether they perceived health benefits from PA. The answers

were dichotomized into: 1) Yes and 2) No.

Statistical analysis

Categorical data are presented as absolute frequency and relative frequency. Continuous data are presented as mean $\pm$ standard deviation or median (p25, p75), according to the Shapiro-Wilk test.

The Chi-square test was used to compare the absolute frequency distribution of functional level in ADLs in each behavioral stratum of the PA level. Logistic regression models were utilized to evaluate PA trajectories from 2015 to 2018 as a function of the level of functional independence, in the three ADL levels in 2018. The analyses were adjusted for gender and age, considering that these variables can act as confounding factors. These variables were considered, to ensure greater precision in the estimates and robustness in the interpretation of the effects of PA trajectories on functionality. A significance level of $p < 0.05$ was considered. The IBM SPSS Statistics program, version 27, was used.

Results

Of the 345 older people assessed in 2015, 223 were reassessed in 2018. Table 1 presents the sociodemographic characteristics, age range, gender, race/ethnicity, whether they live alone or not, and education level. Regarding the participants' profile, there was a predominance of older people aged between 70 and 79 years (44.8%), belonging to the female gender (59.6%), black, brown and other races/colors (50.2%), who live with a partner or family member (84.8%), and have 1 to 4 years of schooling (52.9%).

Regarding the older adults' perception of the benefits and importance of PA, in both 2015 and 2018, the majority of older adults believed in the importance of PA and recognized that it is important for health (Table 2).

Figure 1 presents the trajectories of PA from 2015 to 2018, indicating the percentage of participants who maintained or changed their behavior after three years. In 2015, the percentage of active older adults was 51.3%, while the percentage of insufficiently active older adults was 48.7%. Of the 51.3% of older adults who were active, 24.6% remained active and only 11.2% became insufficiently active in 2018. Considering the 48.7% who were insufficiently active in 2015, 24.5% remained insufficiently active, while 24.1% became active in 2018.

Table 1 – Sociodemographic characterization of participants from an area of social vulnerability, at the end of 2018 (n = 223)

Characteristics	n (%)
Age	
60–69 years	89 (39.9)
70–79 years	100 (44.8)
80+ years	34 (15.3)
Gender	
Female	133 (59.6)
Male	90 (40.4)
Race/ethnicity	
White	99 (44.4)
Brown	81 (36.3)
Black	38 (17.0)
Others*	5 (2.3)
Lives alone	
No	189 (84.8)
Yes	34 (15.2)
Schooling**	
Illiterate	70 (31.7)
1 to 4 years	117 (52.9)
5 or more years	34 (15.4)

* Other: Includes people who identified themselves as Indigenous or Asian, or who did not complete the self-declaration. ** Missing = 2

Table 2 – Perception of the importance of physical activity among older adults, in the initial and final periods, 2015 and 2018

Questions	2015	2018
	n (%)	n (%)
Physical activity is beneficial to health.		
Yes	137 (61.4)	138 (61.9)
No	86 (38.6)	83 (38.1)
Physical activity is important		
Yes	199 (89.2)	203 (91.1)
No	24 (10.8)	20 (8.9)

Table 3 – Comparisons between older people in the behavioral strata of physical activity level from 2015 to 2018 in relation to basic activities of daily living, instrumental activities of daily living, and advanced activities of daily living

	Desirable n (%)	Undesirable n (%)	P
Basic activities of daily living			<0.001
Independent	96 (98.0)	104 (84.6)	
Dependent	2 (2.0)	19 (15.4)	
Instrumental activities of daily living			<0.001
Independent	68 (69.4)	40 (32.5)	
Partially/totally dependent	30 (30.6)	83 (67.5)	
Advanced activities of daily living			<0.001
Independent	84 (85.7)	65 (52.8)	
Dependent	14 (14.3)	58 (47.2)	
Total	98 (100)	123 (100)	

In Table 3, when comparing the PA trajectories of older adults after three years, it was identified that the percentage of older adults in 2018 who presented functional independence in BADLs, IADLs, and AADLs was higher for those who presented desirable PA behavior during the three-year period.

The prevalence of independence values in BADLs, IADLs, and AADLs for older adults who exhibited desirable PA behavior were 98.0%, 69.4%, and 85.7%, respectively (Table 4). A desirable PA trajectory was associated with a higher probability of independence in BADLs (OR: 6.8, 95% CI: 1.45–31.79), IADLs (OR = 4.24, 95% CI: 2.24–8.05), and AADLs (OR = 4.42, 95% CI: 2.16–9.07).

Discussion

The main results of the current study indicated that being physically active over a three-year period is associated with better functional independence in low-income older adults. Considering that maintaining functionality is one of the main indicators of active and healthy aging, regular PA practice has proven to be a relevant protective factor for older adults living in contexts marked by insecurity, and limited access to urban infrastructure, basic sanitation, leisure areas, resources, and information—disadvantages accumulated throughout life that exacerbate functional vulnerability in this population group²⁵.

The older participants in the study showed a decrease in their levels of PA after three years. Considering that this is, in fact, a multifactorial behavior and that there is a greater chance of health impairments throughout old age, it is expected that this organic decrease in PA levels will occur; and perhaps more significantly in people with low incomes, due to environmental and/or socioeconomic/cultural factors, especially PA during leisure time. Harris et al.²⁶ indicate that real changes in PA practices in society are possible when there is alignment with health, social, environmental, and sustainable development goals, which corroborates these findings. Regarding PA trajectories, the current investigation showed that the largest proportion of older adults who became insufficiently active were those who had not engaged in PA in the initial assessment. Aggio et al.²⁷ showed that older people who are active in the early stages of life are more likely to remain active as they age. In this sense, it is important to consider that access to previous PA experiences, especially leisure-time PA, may be limited for low-income

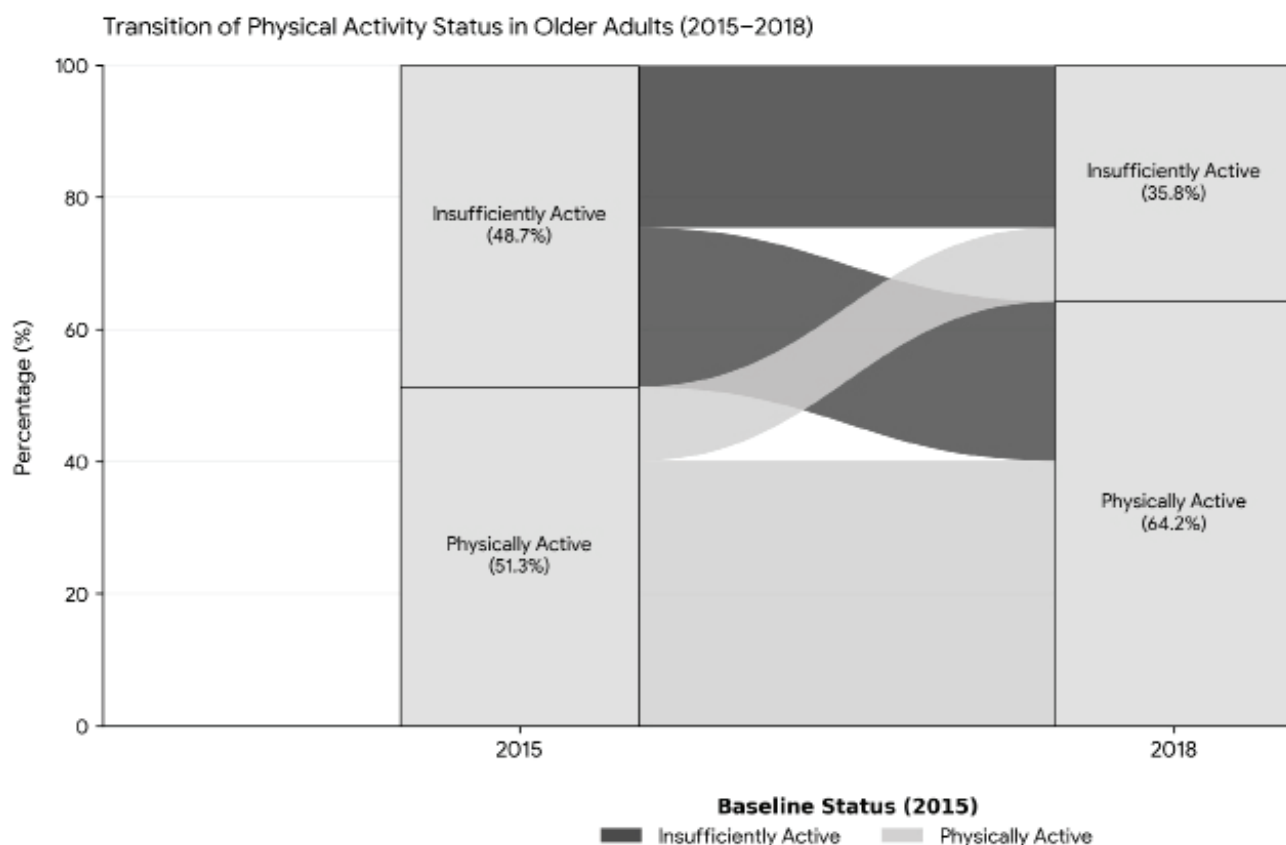


Figure 1 – Trajectories of physical activity between 2015 and 2018 in older adults.

Table 4 – Adjusted association between physical activity trajectory and functional independence in basic activities of daily living, instrumental activities of daily living, and advanced activities of daily living

Physical activity trajectory (2015–2018)	Greater functional independence											
	Basic activities of daily living				Instrumental activities of daily living				Advanced activities of daily living			
	%	OR	CI	p	%	OR	CI	p	%	OR	CI	p
Desirable	98.0	6.8	1.45 – 31.79	0.015*	69.4	4.2	2.24 – 8.05	<0.01*	85.7	4.4	2.16 – 9.07	<0.01*
Undesirable	84.6	1			32.5	1			52.8	1		

Caption: *Adjusted for gender and age.

older adults, as well as which there is limited presence of intersectoral public policies that continuously and effectively promote PA throughout life.

The results indicated that despite low levels of education, participants understood the importance of engaging in regular PA. It is possible that some individual or contextual barriers, or the absence of PA programs near their homes, may have prevented a greater proportion of the older adults from engaging in more PA during the years analyzed in the study. Global recommendations emphasize the importance of increasing movement, regardless of the domain (leisure, transportation, domestic, or work-related)⁹. Therefore, access to opportunities for greater PA at different times of the day should be encouraged and strengthened in public

policies for health prevention and promotion.

Moreno-Agostino et al.²⁸ indicate that socioeconomic conditions are possible mediators in the relationship between PA and healthy aging trajectories. Studies on the prevalence of PA and PA trajectories throughout life corroborate this information by demonstrating that the greatest likelihood of being physically inactive occurs among older people with low income and low education levels^{10,11}. Therefore, social vulnerability appears to hinder access to key resources for PA. Given socioeconomic barriers and living conditions, engaging in PA to ensure better health in the future is possibly more challenging for older adults in low-income contexts. Furthermore, decreased income may be related to difficulty in acquiring medication, accessing

healthcare services, and maintaining a healthy lifestyle, contributing to the loss of or reduction in functional capacity and frailty²⁹. Our data reinforce the idea that the level of functional capacity is influenced by a complex multifactorial network, including the level of PA. Furthermore, these factors can differ between locations and contexts, corroborating data from studies that analyze data from different countries³⁰. Strategies for assessing and maintaining functional independence at different levels through preventive and health promotion actions should be strengthened in Primary Health Care to prioritize low-income older adults.

In the present investigation, the trajectory of PA was most strongly associated with better functional performance in BADLs, followed by IADLs and AADLs. According to the functional continuum theory, BADLs remain stable for a longer period of time in old age because they do not require sophisticated and complex cognitive or motor skills, being performed mainly as a result of routines^{17,25,27,28}. Furthermore, poor functional performance in BADLs showed a significant relationship with frailty conditions in older adults, demonstrating the importance of prioritizing PA practice as a strategy to prevent factors associated with frailty syndrome in low-income older adults^{25,30}. In other words, the present study showed a relationship between PA and better performance in BADLs, indicating that maintaining physically active over time can contribute to preserving autonomy in activities of daily living, remaining in the home environment, and presenting a lower risk of frailty.

The results of the current study referred to two variables that may be associated in a reverse manner, that is, low levels of prior functional independence may also have affected the results of PA practice after three years of follow-up. The choice to use a prospective longitudinal study and analysis through trajectory categories, rather than just levels of PA, was made to mitigate this risk, but caution is still needed in interpreting the results.

Although the current study had a prospective longitudinal design, the follow-up was only three years and there were sample losses, which may increase the risk of temporal bias and compromise the identification of stronger long-term associations between variables. Furthermore, because the sample was made up of a specific group, the data cannot be broadly generalized, and the study used instruments based solely on self-report, which may overestimate levels of PA and functional independence. Future cohort studies

of older adults with longer follow-up periods, analyzing PA and functional performance, are still needed to strengthen the findings of this investigation, especially among low-income older adults. The COVID-19 pandemic may have further affected these variables among older adults, particularly those with low incomes, reinforcing the need for more studies on this topic.

The results of the current research indicated that PA trajectories are associated with functional performance in low-income older adults. In other words, being consistently active or increasing the level of PA over a three-year period was associated with a lower chance of older adults from low-income backgrounds exhibiting low functional performance in BADLs, IADLs, and AADLs.

These findings highlight the urgency of public policies that strengthen Primary Health Care through intersectoral actions capable of expanding access to opportunities for PA, focusing on equity, disability prevention, and the promotion of active and functional aging, based on health promotion, in line with the principles of the Unified Health System (SUS) — universality, comprehensiveness, and social participation — which guide the organization of health actions and reinforce the commitment to reducing inequalities in care for the older population.

Conflict of interest

The authors declare no conflict of interest.

Funding

This research was supported by the São Paulo Research Foundation (FAPESP - processes 2014/50104-0, 2016/15235-1 and 2020/03571-2), the Coordination for the Improvement of Higher Education Personnel (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - CAPES - funding code 001), and the National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq).

Authors' contribution

Rico IP: Research; Data curation; Project administration; Data presentation design; Original manuscript writing; Writing - revision and editing; Approval of the final manuscript version. Zazzetta MS: Conceptualization; Methodology; Research; Tool provision; Supervision; Project administration; Funding acquisition; Writing - revision and editing; Approval of the final manuscript version. Gratão ACM, Orland AAS, Nascimento C, Orlandi FS, Jesus ITM, Gramani-Say K, Guarisco LPC, and Parvarini SCI: Software development, implementation, and testing;

Data and experiment validation; Research; Writing - revision and editing; Approval of the final manuscript version. Pott Junior H: Research; Writing - revision and editing; Approval of the final manuscript version. Castro PC: Conceptualization; Methodology; Research; Writing - revision and editing; Approval of the final manuscript version. Gomes GAO: Conceptualization; Methodology; Software development, implementation and testing; Data and experiment validation; Data analysis; Research; Tool provision; Data curation; Supervision; Project management; Data presentation design; Original manuscript writing; Writing - revision and editing; Approval of the final manuscript version.

Statement regarding the use of artificial intelligence tools in the article writing process.

The authors did not use artificial intelligence tools to prepare the manuscript.

Availability of research data and other materials

Data are available upon request by interested parties.

Acknowledgements

The authors express their gratitude to the Family Health Centers, the research volunteers, and the financial support of the São Paulo Research Foundation (*Fundação de Amparo à Pesquisa do Estado de São Paulo* - FAPESP).

References

- Taguchi CK, Menezes PL, Melo ACS, Santana LS, Conceição WRS, Souza GF, et al. Síndrome de fragilidade e riscos de queda na comunidade idosa. *Codas*. 2022;34(6):e20210025. doi: <https://doi.org/10.1590/2317-1782/202120210025pt>
- Wang X, Hu J, Wu D. Risk factors for frailty in older adults. *Medicine (Baltimore)*. 2022;101(34):e30169. doi: <https://doi.org/10.1097/md.00000000000030169>
- Rosalem L, da Cunha M. Socioeconomic Vulnerabilities and Population Aging in Brazil: a Longitudinal Study. *Population Ageing*. 2025;18:569–94. doi: <https://doi.org/10.1007/s12062-025-09476-x>
- Trintinaglia V, Bonamigo AW, Azambuja MS. Public health policies for healthy aging in Latin America: an integrative review. *Rev Bras Promoç Saúde*. 2022;35(1):15. doi: <https://doi.org/10.5020/18061230.2022.11762>
- Du Z, Sato K, Tsuji T, Kondo K, Kondo N. Sedentary behavior and the combination of physical activity associated with dementia, functional disability, and mortality: a cohort study of 90,471 older adults in Japan. *Prev Med*. 2024;107879. doi: <https://doi.org/10.1016/j.ypmed.2024.107879>
- Wang L, Chen H, Zhu H, Hu Z, Zhou C, Hu X. Physical activity as a predictor of activities of daily living in older adults: a longitudinal study in China. *Front Public Health*. 2024;12:1444119. doi: <https://doi.org/10.3389/fpubh.2024.1444119>
- Campbell E, Rocha FP, Welsh P, Morales CC, Pell JP, Ho FK, et al. The effect of exercise on quality of life and activities of daily life in frail older adults: a systematic review of randomized controlled trials. *Exp Gerontol*. 2021;147:111287. doi: <https://doi.org/10.1016/j.exger.2021.111287>
- Cunningham C, O'Sullivan R, Caserotti P, Tully MA. Consequences of physical inactivity in older adults: a systematic review of reviews and meta analyses. *Scand J Med Sci Sports*. 2020;30(5):816–27. doi: <https://doi.org/10.1111/sms.13616>
- Brasil. Ministério da Saúde. Secretaria de Atenção Primária à Saúde. Departamento de Promoção da Saúde. Guia de Atividade Física para a População Brasileira [Internet]. Brasília: Ministério da Saúde; 2021. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/guia_atividade_fisica_populacao_brasileira.pdf. 2026 January]
- Meneguci CAG, Meneguci J, Sasaki JE, Tribess S, Júnior JSV. Physical activity, sedentary behavior and functionality in older adults: a cross sectional path analysis. *PLoS One*. 2021;16(1):e0246275. doi: <https://doi.org/10.1371/journal.pone.0246275>
- Spiteri K, Broom D, Bekhet AH, de Caro JX, Laventure B, Grafton K. Barreiras e motivadores da participação na atividade física em adultos de meia idade e idosos: uma revisão sistemática. *J Aging Phys Act*. 2019;27(4):929–44. doi: <https://doi.org/10.1123/japa.2018-0343>
- Lounassalo I, Salin K, Kankaanpää A, Hirvensalo M, Palomäki S, Tolvanen A, et al. Distinct trajectories of physical activity and related factors during the life course in the general population: a systematic review. *BMC Public Health*. 2019;19(1):1–12. doi: <https://doi.org/10.1186/s12889-019-6513-y>
- Gomes GAO, Brown WJ, Codogno JS, Mielke GI. Twelve year trajectories of physical activity and health costs in mid age Australian women. *Int J Behav Nutr Phys Act*. 2020;17(1):1–9. doi: <https://doi.org/10.1186/s12966-020-01006-6>
- Aggio D, Papachristou E, Papacosta O, Lennon LT, Ash S, Whincup PH, et al. Trajetórias de vinte anos de tipos de atividade física da meia idade à velhice. *Med Sci Sports Exerc*. 2019;51(3):481–89. doi: <https://doi.org/10.1136/jech-2019-212706>
- Chen T, Honda T, Chen S, Narazaki K, Kumagai S. Dose-response association between accelerometer assessed physical activity and incidence of functional disability in older Japanese adults: a 6 year prospective study. *J Gerontol A Biol Sci Med Sci*. 2020;75:1763–70. doi: <https://doi.org/10.1093/gerona/glaa046>
- Kurita S, Doi T, Tsutsumimoto K, Nakakubo S, Kim M, Ishii H, et al. Association of physical activity and cognitive activity with disability: a 2 year prospective cohort study. *Phys Ther*. 2020;100:1289–95. doi: <https://doi.org/10.1093/ptj/pzaa052>
- Ikegami ÉM, Souza LA, Tavares DMDS, Rodrigues LR. Functional capacity and physical performance of community dwelling elderly: a longitudinal study. *Science Public Health*. 2020;25:1083–90. doi: <https://doi.org/10.1590/1413-81232020253.18512018>
- Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Suggestions for utilization of the mini mental state examination in Brazil. *Arq Neuropsiquiatr*. 2003;61(3B):777–81. doi: <https://doi.org/10.1590/S0004-282X2003000500014>
- Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW. Studies of illness in the aged: the index of ADL: a standardized measure of biological and psychosocial function. *JAMA*. 1963;185(12):914–19. doi: <https://doi.org/10.1001/jama.1963.03060120024016>

20. Lino VTS, Pereira SRM, Camacho LAB, Ribeiro Filho ST, Buksman S. Cross cultural adaptation of the independence scale in activities of daily living (Katz Scale). *Cad Saude Publica*. 2008;24(1):103–12. doi: <https://doi.org/10.1590/S0102-311X2008000100010>
21. Lawton MP, Brody MH. Assessment of older people: self maintaining and instrumental activities of daily living. *Gerontologist*. 1969;9:179–86. doi: <https://doi.org/10.1111/j.1532-5415.1983.tb03391.x>
22. Dos Santos JS, Virtuoso J. Reliability of the Brazilian version of the instrumental activities of daily living scale. *RBPS*. 2018;21(4):290–96. doi: <https://doi.org/10.5020/575>
23. Reuben DB, Solomon DH. Assessment in geriatrics: of caveats and names. *J Am Geriatr Soc*. 1989;37(6):570–72. doi: <https://doi.org/10.1111/j.1532-5415.1989.tb05691.x>
24. Benedetti TRB, Antunes PC, Rodriguez Añez CR, Mazo GZ, Petroski EL. Reprodutibilidade e validade do Questionário Internacional de Atividade Física (IPAQ) em homens idosos. *Rev Bras Med Esporte*. 2007;13(1):11–6. doi: <https://doi.org/10.1590/S1517-86922007000100004>
25. Wleklik M, Uchmanowicz I, Jankowska EA, Vitale C, Lisiak M, Drozd M, et al. Multidimensional approach to frailty. *Front Psychol*. 2020;11:564. doi: <https://doi.org/10.3389/fpsyg.2020.00564>
26. Harris D, Dlima SD, Gluchowski A, Hall A, Elliott E, Munford L. The effectiveness and acceptability of physical activity interventions amongst older adults with lower socioeconomic status: a mixed methods systematic review. *Int J Behav Nutr Phys Act*. 2024;21(1). doi: <https://doi.org/10.1186/s12966-024-01666-8>
27. Aggio D, Papachristou E, Papacosta O, et al. Trajectories of self reported physical activity and predictors during the transition to old age: a 20 year cohort study of British men. *Int J Behav Nutr Phys Act*. 2018;15(1):14. doi: <https://doi.org/10.1186/s12966-017-0642-4>
28. Moreno Agostino D, et al. The impact of physical activity on healthy ageing trajectories: evidence from eight cohort studies. *Int J Behav Nutr Phys Act*. 2020;17(1):92. doi: <https://doi.org/10.1186/s12966-020-00995-8>
29. Zhu Z, Chen S, Chen S, Chen X, Liang Y, Sun S, et al. Interaction between physical activity and deficit-based frailty on all-cause mortality in older adults: a prospective study of five population-based cohorts. *Lancet Reg Health West Pac*. 2026;66:101780. doi: <https://doi.org/10.1016/j.lanwpc.2025.101780>
30. Huang L, Liang Z, Chen H. Association between physical activity and frailty transitions in middle-aged and older adults: a nationwide longitudinal study. *Int J Behav Nutr Phys Act*. 2025;22(1):31. doi: <https://doi.org/10.1186/s12966-025-01725-8>

Received: 08/31/2025

Revised: 10/22/2025

Approved: 03/27/2026

Editor in ChiefRaphael Ritti-Dias 

Universidade Nove de Julho, São Paulo, São Paulo, Brazil.

Section editorEmerson Sebastião 

University of Illinois Urbana-Champaign, Urbana, United States

Cite this article as:

Rico IP, Zazzetta MS, Gratão ACM, Santos-Orlandi AA, Nascimento CMC, Orlandi FS, Pott Junior H, Jesus ITM, Gramani-Say K, Guarisco LPC, Castro PC, Pavarini SCI, Gomes GAO. Physical activity patterns and functional performance among low-income older adults. *Rev. Bras. Ativ. Fis. Saúde*. 2026;31:e0450. doi: [10.12820/rbafs.31e0450](https://doi.org/10.12820/rbafs.31e0450)

Reviewers' assessment

The reviews of this article were originally conducted in Portuguese. This version has been translated using ChatGPT and subsequently reviewed by the Chief Editors.

Reviewer A

Anonymous

- Was any indication of plagiarism observed in the manuscript?
- No
- Did the authors provide clarification regarding the ethical procedures adopted to conduct the research?
- Yes

Comments to the authors

- The title does not align with the objective or the final conclusion, and it is also unclear.
- (1–7) The objective described here differs from what is presented throughout the text. Pay attention to the distinction between association and relationship, and based on the statistical analysis used, determine which is appropriate. Also, clarify the difference between physical activity and exercise, and ensure consistency throughout the manuscript. If necessary, include a paragraph explaining these differences.
- (1–22) According to the definitions of exercise in MeSH and DeCS, this would not be an appropriate keyword for this study. Replace it and review the others. Arrange keywords in order of importance relative to the title. “Low income” is not in the title but appears in the first paragraph. First adjust the title and objectives, then reorganize the paragraphs. The writing needs better harmony—avoid paragraphs that are too long or too short. Aim for 8–10 lines; some have 12 lines, others only 5.
- (6–12) Was the data collection conducted over 2 years?
- (9–11) The sample size calculation was not described.
- Review punctuation, especially the use of commas, and check punctuation in the reference list.

Final decision

- Major revisions required.

Reviewer B

Anonymous

- Was any indication of plagiarism observed in the

manuscript?

- Not applicable
- Did the authors provide clarification regarding the ethical procedures adopted to conduct the research?
- Yes
- **Comments to the authors**
- The topic is interesting. It is a longitudinal study, and the authors present a broad and attentive approach to the demands of functional disability in older adults.
- However, some aspects require attention. Since data collection was conducted in 2015 and 2018, temporality was not addressed in the discussion of results or in the limitations. Temporality must be considered, including justification, limitations, and discussion. The data were collected prior to the COVID-19 pandemic, yet no mention is made of its potential impact on functional capacity in older adults, particularly those with low income. Additionally, there is a lack of dialogue comparing the findings with national and international studies.
- In the discussion, one sentence stands out and warrants reflection (Page 13, lines 19–22):
- “For low-income older adults, often unable to engage in physical activity during leisure time, it may be strategic to encourage at least the maintenance of physical activity through domestic, work, and/or transport activities of light or moderate intensity.”
- Although the first paragraph on page 14 highlights the urgency and importance of expanding access to physical activity through intersectoral public health policies, the highlighted sentence may suggest the opposite. From a simplistic (or even ill-intentioned) perspective, it could be interpreted as justification for not expanding access. For example: since low-income older adults are often unable to access leisure-time activity, they should simply remain active through what they already do (domestic, work, or transport activities), thereby removing or reducing the State’s responsibility to expand access and ensure opportunities for leisure-time physical activity.
- It is important that older adults (regardless of income) remain as active as possible in their daily lives. However, “encouraging” activity in non-lei-

sure domains without emphasizing access to leisure-time activity distances the manuscript from commitments to equity, comprehensiveness of care, and universality. Therefore, this suggestion aims to reinforce the reduction of inequalities (by improving living conditions), rather than inadvertently reinforcing them in discourse.

- Few recent studies (from the last 5 years) were used in the introduction and discussion. Please update the references, particularly in the discussion section. Reference 14 was not found—check the numbering order in the reference list.
- In Table 1, review the terminology for race/ethnicity or race/color for the category “Mulata/Cabocla/Parda,” according to IBGE standards ([https://atlas-](https://atlas-escolar.ibge.gov.br/glossario/cor-ou-raca.html)

[escolar.ibge.gov.br/glossario/cor-ou-raca.html](https://atlas-escolar.ibge.gov.br/glossario/cor-ou-raca.html)).

- Other points: replace the keyword “exercise” with “motor activity,” since the study evaluates physical activity. On page 2, line 5, it is suggested to follow the recommendations of the Brazilian Physical Activity Guidelines. In the discussion, revise how references are cited when author names are mentioned in the text (e.g., page 13, line 10: change “Aggio et al. (2017)” to “Aggio et al. 15” with the number in superscript—note that the current layout does not allow superscript formatting).

Final decision

- Major revisions required.