ARE BARRIERS TO PHYSICAL ACTIVITY ASSOCIATED WITH CHANGING PHYSICAL ACTIVITY LEVELS AND SEDENTARY TIME IN PATIENTS WITH PERIPHERAL ARTERIAL DISEASE? A LONGITUDINAL STUDY

ABSTRACT

The aim of the current study was to analyze the association between the barriers to and changes in physical activity levels and sedentary behavior, as well as to examine whether these barriers change over time in patients with peripheral artery disease (PAD). In this longitudinal study, we assessed 72 patients (68% men; 65.7±9.2y.o.). Physical activity was measured over a seven-day period using an accelerometer and data were collected on time spent in sedentary activities, low-light physical activities, and moderate-to-vigorous physical activities. Personal and environmental barriers to physical activity were collected using yes or no questions. Assessments were repeated in the same patients after 27 months (95% CI: 26-28 months). Most barriers remained stable in these patients; however, those who reported lack of money experienced an increase in sedentary behavior (ß=392.9 (159.7) min/week, p=0.02) and a decrease in low-light physical activity (ß=-372.4 (140.1) min/week, p = 0.02). These findings suggest that symptomatic PAD patients typically exhibit stable barriers over time, and individuals reporting lack of money demonstrated a decrease in low-light physical activity and an increase in sedentary behavior after 27 months.

Keywords: intermittent claudication; sedentary behavior; physical activity.

INTRODUCTION

Peripheral artery disease (PAD) affects around 200 million people worldwide (Aboyans et al., 2018), with intermittent claudication (IC) being its primary symptom (Gerhard-Herman et al., 2016). Patients with PAD present an impaired walking capacity (Cucato et al., 2016), lower muscular strength (Camara et al., 2010; Meneses et al., 2012), poor cardiorespiratory fitness (Farah et al., 2015), and several comorbid conditions (Farah et al., 2014).

These factors seem to affect the physical activity level in these patients. In fact, symptomatic PAD leads to a reduction in physical activity level, as reported by Gerage et al. (2019), who found that only 3.4% of patients met the recommendation of 150 minutes per week of physical activity. Furthermore, it is known that these patients tend to remain sedentary most of the time (de Sousa et al., 2019; Farah, Ritti-Dias, Montgomery, et al., 2016; Gerage et al., 2019).

Previous cross-sectional studies have demonstrated that symptomatic PAD patients face barriers to physical activity, particularly related to symptom worsening (Barbosa et al., 2015; de Sousa et al., 2019; Ragazzo et al., 2021). Despite this evidence, to date, only one study has investigated the association between the barriers to and level of physical activity in PAD patients (Barbosa et al., 2015). The authors showed that a lack of green areas was associated with a lower number of steps, measured by pedometers. Naturally, the study design and the measure of physical activity limit understanding of the impact that barriers may have on the physical activity level of these patients.

Therefore, it remains unknown whether barriers are associated with changes in physical activity levels in a longitudinal design. In addition, the perception of barriers to physical activity can change over time, and no studies have analyzed these potential changes. Thus, the aim of the current study was to analyze the association between the barriers to and changes in physical activity levels and sedentary behavior, as well as to examine whether these factors change over time in patients with PAD.

METHODS

Design study and ethics

This is a longitudinal study, conducted according to the Strengthening the Reporting of Observational Studies guidelines (von Elm et al., 2014). The same patients were assessment at two moments: baseline and after approximately two years of follow-up. This study was approved by the Research Ethics Committee, according to the International Standards of Ethics, and conforms to the Declaration of Helsinki. All the participants provided written informed consent to participate in this study.

Sampling and selection

Patients in this study were recruited in tertiary centers in São Paulo, Brazil. On the day of their medical appointment, patients who met the following inclusion criteria were invited to participate in the study: age > 50 years, with symptomatic PAD in one or both legs, ankle-brachial index (ABI) < 0.90; lack of critical limb ischemia, pain during rest, non-compressible vessels, amputated limbs and/or ulcers, and lack of pulmonary diseases. Upon completion of these assessments, patients were provided with the accelerometer together with usage instructions. They were then scheduled to return to the laboratory at least 7 days later to complete the remaining assessments and return the accelerometers, as detailed in the data collection section. Patients who accumulated less than four days of accelerometer use (averaging 10 hours per day), those who did not wear the accelerometer for at least one day during the weekend, or those who provided insufficient data related to the barriers to physical activity were excluded from the analysis of this study.

Data collection

Data collections were conducted between September 2015 and October 2017 (baseline) and from October 2017 to November 2019 (follow-up). The same patients were assessed at each time point (baseline and follow-up), each collection moment consisted of two visits. During the first visit, patients underwent a screening process that included the evaluation of their medical history and demographic data. Additionally, their functional capacity was evaluated through the six-minute walk test. Patients were then provided with an accelerometer to wear for seven consecutive days. Following this period, patients were summoned to return the accelerometer and to complete questionnaires related to quality of life, and barriers to physical activity. The same procedures were repeated after approximately 27 months (95%CI: 26-28 months).

Physical activity level and sedentary behaviour (outcomes)

Physical activity level and sedentary behavior (SB) were measured by a triaxial accelerometer GT3X + (Actigraph, Pensacola, FL, USA) which operated at a sampling rate of 60Hz. All patients were instructed to wear the accelerometer for seven consecutive days, removing it only during sleep, showering, or water activities. The device was securely fastened to the right side of the hip using an elastic strap. After the recordings, the recorded data were uploaded and analyzed in 60-second intervals using Actilife software, version 6.02 (Actigraph, Pensacola, FL, EUA).

The average of the total time spent in each physical activity intensity was calculated using the specific cut-off points for older subjects, adapted by Copeland and Esliger (2009), considering SB as 0-99 counts/min, low-light physical activity (LLPA) as 100-1040 counts/min, and moderate-vigorous physical activity (MVPA) as ≥ 1041 counts/min, using the vertical axis, analyzed in min/day, and adjusting for the time and number of days the device was used. The cut-off points were published in previous studies (de Sousa et al., 2019; Gerage et al., 2019).

Barriers to physical activity (predictors)

The personal barriers to physical activity were evaluated by a questionnaire previously used for PAD patients (Barbosa et al., 2015; Cavalcante et al., 2015; de Sousa et al., 2019; Ragazzo et al., 2021), which included the following items: fatigue, lack of time, not having anyone to accompany them in physical activity, not having enough money to practice physical activity, lack of knowledge and uncertainty regarding the benefits of physical activity, being afraid of falling, and urinary incontinence. In addition, specific barriers for PAD patients (lack of physical energy, needing to rest because of pain, and pain induced by walking) were included.

The environmental barriers were evaluated using a previously validated questionnaire (Barbosa et al., 2015; Cavalcante et al., 2015; de Sousa et al., 2019; Ragazzo et al., 2021), and included: lack of security, inclement weather, lack of green areas, streets that are not flat, lack of satisfactory sidewalks, lack of street pedestrian crossings, presence of obstacles that exacerbate leg pain (e.g., hills and stairs), not having places to sit when feeling pain, vehicular traffic that hinders locomotion, and some difficulty getting to a place where physical activity can be performed.

For all questions, the patients indicated whether the barrier affected their ability to engage in physical activity by providing answers to closed yes or no questions.

Clinical data (confounders)

Sociodemographic data and risk factors were obtained through interviews conducted by trained evaluators. The variables obtained in these interviews were sex, age, and education. The severity of PAD was determined by a single evaluator, through the ABI, in accordance with standardized guidelines (Aboyans et al., 2018). Walking capacity was assessed using the 6-minute walk test, which was conducted in a 30-m long corridor following the previously established protocol (Montgomery et al., 1998). The total walking distance was defined as the maximum distance completed by the patient at the end of 6 minutes.

Statistical Analysis

Data were stored and analyzed using the Statistical Package for the Social Sciences software (version 24.0). The Kolmogorov-Smirnov test was used to analyze the normality of the data. Descriptive analysis was performed, using mean ± standard deviation or median (interquartile range) and frequency. The paired-sample t test (continuous variables) or McNemar test (categorical variables) was used to compare the data from the baseline and follow-up periods.

The associations between the changes in physical activity levels and barriers at follow-up were analyzed using multiple linear regressions. The analyses were adjusted for sex, changes in ABI and the 6-minute walk test, and baseline values for each outcome (SB, LLPA, and MVPA). An independent regression model was constructed for each barrier. Changes in physical activity and SB levels were calculated (Δ=Follow-up – Baseline). The significance level was set at $p<0.05$ for all analyses.

RESULTS

The flowchart of the study is demonstrated in Figure 1. Initially, 289 participants were eligible at visit 1; however, there were some dropouts (n=81) between visits 1 and 2 for various reasons, such as not attending visit 2 for personal reasons, not wearing the accelerometer properly, or not responding to the questionnaire. At the follow-up point, 97 participants returned to the laboratory, with 25 dropouts between visits 1 and 2, resulting in a final sample size of 72 participants. Data exhibited a parametric distribution, and therefore, are presented as mean and standard deviation, except for MVPA and SB, for which the data are presented as median and interquartile range. Patients wore the accelerometer for 6.3±0.8 days at baseline and 6.2±0.8 days at follow-up. Table 1 presents the patient's characteristics. At the two-year follow-up, SB increased and MVPA level decreased. There was also a decrease in the ABI, but there were no changes in these risk factors.

Table 2 presents the prevalence of barriers at baseline and after 27 months. Not having anyone to accompany them, lack of satisfactory places for the practice of physical activity, and not having places to sit when feeling pain had a lower prevalence at the follow-up. Baseline barriers were not associated with changes in physical activity levels ($p>0.05$ for all).

There was a positive association between the barrier lack of money and SB and a negative association with LLPA level at the follow-up for sex, changes in ABI, and the 6-minute walk test, and baseline values for each outcome. On the other hand, none of the follow-up environmental barriers were associated with changes in physical activity levels or SB in these patients (See table 3).

DISCUSSION

The main findings of this study were: 1) personal and environmental barriers remained stable over time; 2) Reported barriers such as lack of money were associated with decreased LLPA and increased SB.

Personal barriers displayed greater stability over time, in contrast to environmental barriers. The persistence of personal barriers was anticipated, given that the patients remained clinically compromised, and there was a concurrent deterioration in the ABI. In contrast, environmental barriers are associated with individuals. Interestingly, even though environmental barriers are strongly associated with IC symptoms (Cavalcante et al., 2015), increases in these factors did not directly translate into reduced physical activity and increased SB, so it is possible that other variables are associated with these outcomes.

The results of this study showed that the most prevalent personal barriers were related to PAD symptoms, including walking-induced pain, needing to rest because of leg pain, and being afraid of falling or worsening the disease, as well as other health conditions. Similarly, a prior study reported that patients with more severe symptoms tend to report more barriers related to their symptoms, as they experience greater difficulty in walking (Cavalcante et al., 2015).

Patients who presented the barrier lack of money showed decreases in LLPA and increases in SB. In contrast, a previous study did not demonstrate this association with physical activity level in PAD patients. This divergence could have been due to the difference in the instruments used to measure the physical activity level (pedometer and accelerometer). Although both instruments are adequate for this measurement, previous studies have shown that the accelerometer has higher validity and reliability indices than the pedometer (Copeland & Esliger, 2009; Harris et al., 2009).

Our study showed that patients who presented the barrier lack of money demonstrated an increase in SB. Moreover, patients with IC symptoms and lower economic status reported more barriers to engaging in physical activity compared to patients with higher financial status (Cavalcante et al., 2015). Among Brazilian older adults with chronic diseases and low income, SB accounted for approximately 710 minutes/day, and only 0.4% of the patients met the recommended daily limit of ≤8 hours/day for SB (Soares et al., 2023). This might in part be explained by the limited leisure opportunities, with sedentary activities, such as television viewing and smartphone use being very frequent among this group (Brazilian Statistics Institute, 2017). In fact, older adults with higher economic conditions are more likely to engage in physical activity (Dos Santos et al., 2018) and spend less time watching television (Russell et al., 2019). Therefore, the current study adds to this body of knowledge by indicating that a lack of money is associated with increases in

SB over time. These findings underscore the importance of developing strategies to provide access to physical activities in this group.

It is well-documented that patients with PAD tend to spend extended periods in SB (de Sousa et al., 2019; Farah, Ritti-Dias, Cucato, et al., 2016; Farah, Ritti-Dias, Montgomery, et al., 2016). Previous studies have also shown that patients with IC who engage in prolonged SB exhibit a worse inflammatory and cardiometabolic profile (Farah, Ritti-Dias, Montgomery, et al., 2016). Furthermore, there is a known association between reduced LLPA and increased mortality and cardiovascular events (Garg et al., 2006). Studies involving healthy populations and clinics have shown that low LLPA levels and high SB were associated with several risk factors, such as high blood pressure (Gerage et al., 2015), increased arterial stiffness (Endes et al., 2016), lower heart rate variability (Tebar et al., 2020), lower HDL cholesterol (Figueiro et al., 2019), and mortality (Zhao et al., 2020).

Higher levels of MVPA in patients with IC are associated with better cognitive performance, including improved memory (Cavalcante et al., 2018). In addition, engaging in at least 150 minutes of MVPA per week among individuals over 60 years of age has been shown to reduce mortality by 28% compared to those who do not meet this recommendation (Hupin et al., 2015). Despite the recommendations, only 3.4% of patients with IC meet the necessary recommendations (Gerage et al., 2019), highlighting the need for interventions aimed at increasing MVPA in this population. However, in our study, we did not identify any barriers that could serve as predictors of MVPA. Instead of completely discounting the predictive impact on MVPA, it is possible that in patients with symptomatic PAD, MVPA is so low that only a deterioration in the disease condition or functional capacity can directly influence it, which may not occur within two years. Therefore, future longitudinal studies should focus on analyzing factors associated with reduced MVPA among patients with IC.

The findings of our study highlight that prior identification of barriers to physical activity in this population can minimize the impact on the level of physical activity over time. The present study had a longitudinal design, which allowed the establishment of causality between the dependent and independent variables. However, limitations need to be highlighted. In this study we used a specific statistical approach considering theoretical and statistical adjustments. The statistical approach chosen, as well as the existence of other confounding factors, may influence the associations presented. Therefore, future studies are needed to confirm the present findings. The instrument used to measure physical activity levels, the accelerometer, is the gold-standard instrument for this purpose.

Among the limitations of the present study, it is worth noting that the sample consisted of patients with moderate symptoms of IC, so it is not possible to extrapolate these results to asymptomatic patients or patients with more severe symptoms, due to the distinct clinical characteristics of the disease (Aboyans et al., 2018). The lack of assessment of the type and context in which the physical activity was performed is another limitation that limits understanding of whether barriers affect the different types of physical activities (occupational, domestic, transport, and leisure). It would also be insightful to propose specific interventions for each patient. The accelerometer cut-off points used were based on data from older adults without PAD, which may underestimate the physical activity levels of PAD patients that present walking impairments, limiting their physical activity practice. Nevertheless, it is noteworthy that other studies have also employed the same cut-off points (de Sousa et al., 2019; Gerage et al., 2019). Future studies should explore alternative cut-off points for this specific population. It was also not possible to control whether there was a change in the address of the participants, which could change the perception of barriers. In fact, changing one's place of residence can pose a barrier to physical activity, particularly in terms of transportation and leisure (Salvo et al., 2018).

CONCLUSION

Barriers to physical activity in symptomatic PAD patients remain stable over time, and those who reported the barrier lack of money demonstrated decreased LLPA and increased SB after 27 months. In this context, it is evident that providing information to these patients about the feasibility of elevating levels of LLPA and diminishing sedentary behavior, without incurring financial costs, is crucial. Future studies could explore the efficacy of implementing behavior change programs tailored to these patients, aiming not only to enhance their physical activity but also to mitigate sedentary behavior. This would contribute valuable insights for the development of effective strategies to promote a more active and healthier lifestyle among this specific population.

REFERENCES

Aboyans, V.Ricco, J. B.Bartelink, M. E. L.Bjorck, M.Brodmann, M.Cohnert, T.Collet, J. P.Czerny, M.De Carlo, M.Debus, S. et al. 2018. 2017 ESC Guidelines on the Diagnosis and Treatment of Peripheral Arterial Diseases, in collaboration with the European Society for Vascular Surgery (ESVS): Document covering atherosclerotic disease of extracranial carotid and vertebral, mesenteric, renal, upper and lower extremity arteriesEndorsed by: the European Stroke Organization (ESO)The Task Force for the Diagnosis and Treatment of Peripheral Arterial Diseases of the European Society of Cardiology (ESC) and of the European Society for Vascular Surgery (ESVS). *Eur Heart J*, 39 (9): 763-816. doi: 10.1093/eurheartj/ehx095

Barbosa, J. P.Farah, B. Q.Chehuen, M.Cucato, G. G.Farias Junior, J. C.Wolosker, N.Forjaz, C. L.Gardner, A. W. & Ritti-Dias, R. M. 2015. Barriers to physical activity in patients with intermittent claudication. *International journal of behavioral medicine*, 22 (1): 70-76. doi: 10.1007/s12529-014-9408-4

Brazilian Statistics Institute. (2017). *Pesquisa Nacional por Amostras de Domicílios Contínua*. Rio de Janeiro.

Camara, L. C.Ritti-Dias, R. M.Forjaz, C. L.Greve, J. M.Santarem, J. M.Jacob-Filho, W.Puech-Leao, P. & Wolosker, N. 2010. Cardiovascular responses during isokinetic muscle assessment in claudicant patients. *Arquivos brasileiros de cardiologia*, 95 (5): 571-576. doi:

Cavalcante, B. R.Farah, B. Q.Barbosa, J. P. A.Cucato, G. G.da Rocha Chehuen, M.da Silva Santana, F.Wolosker, N.de Moraes Forjaz, C. L. & Ritti-Dias, R. M. 2015. Are the barriers for physical activity practice equal for all peripheral artery disease patients? *Archives of physical medicine and rehabilitation*, 96 (2): 248-252. doi: 10.1016/j.apmr.2014.09.009

Cavalcante, B. R.Germano-Soares, A. H.Gerage, A. M.Leicht, A.Tassitano, R. M.Bortolotti, H.de Mello Franco, F. G.Wolosker, N.Cucato, G. G. & Ritti-Dias, R. M. 2018. Association between physical activity and walking capacity with cognitive function in peripheral artery disease patients. *European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery*, 55 (5): 672-678. doi: 10.1016/j.ejvs.2018.02.010

Copeland, J. L. & Esliger, D. W. 2009. Accelerometer assessment of physical activity in active, healthy older adults. *Journal of aging and physical activity*, 17 (1): 17-30. doi: 10.1123/japa.17.1.17

Cucato, G. G.Correia Mde, A.Farah, B. Q.Saes, G. F.Lima, A. H.Ritti-Dias, R. M. & Wolosker, N. 2016. Validation of a Brazilian Portuguese Version of the Walking Estimated-Limitation Calculated by History (WELCH). *Arquivos brasileiros de cardiologia*, 106 (1): 49-55. doi: 10.5935/abc.20160004

de Sousa, A. S. A.Correia, M. A.Farah, B. Q.Saes, G.Zerati, A. E.Puech-Leao, P.Wolosker, N.Cucato, G.

G. & Ritti-Dias, R. M. 2019. Barriers and Levels of Physical Activity in Patients With Symptomatic Peripheral Artery Disease: Comparison Between Women and Men. *Journal of aging and physical activity*, 27 (5): 719-724. doi: 10.1123/japa.2018-0206

Dos Santos, C. E. S.Manta, S. W.Maximiano, G. P.Confortin, S. C.Benedetti, T. R. B.d'Orsi, E. & Rech, C. R. 2018. Accelerometer-Measured Physical Activity and Sedentary Behavior: A Cross-Sectional Study of Brazilian Older Adults. *J Phys Act Health*, 15 (11): 811-818. doi: 10.1123/jpah.2017-0456

Endes, S.Schaffner, E.Caviezel, S.Dratva, J.Autenrieth, C. S.Wanner, M.Martin, B.Stolz, D.Pons, M.Turk, A. et al. 2016. Physical activity is associated with lower arterial stiffness in older adults: results of the SAPALDIA 3 Cohort Study. *European journal of epidemiology*, 31 (3): 275-285. doi: 10.1007/s10654-015-0076-8

Farah, B. Q.Ritti-Dias, R. M.Cucato, G. G.Chehuen Mda, R.Barbosa, J. P.Zeratti, A. E.Wolosker, N. & Puech-Leao, P. 2014. Effects of clustered comorbid conditions on walking capacity in patients with peripheral artery disease. *Ann Vasc Surg*, 28 (2): 279-283. doi: 10.1016/j.avsg.2013.01.020

Farah, B. Q.Ritti-Dias, R. M.Cucato, G. G.Meneses, A. L. & Gardner, A. W. 2015. Clinical predictors of ventilatory threshold achievement in patients with claudication. *Medicine and science in sports and exercise*, 47 (3): 493-497. doi: 10.1249/MSS.0000000000000434

Farah, B. Q.Ritti-Dias, R. M.Cucato, G. G.Montgomery, P. S. & Gardner, A. W. 2016. Factors Associated with Sedentary Behavior in Patients with Intermittent Claudication. *European journal of vascular and endovascular surgery : the official journal of the European Society for Vascular Surgery*, 52 (6): 809-814. doi: 10.1016/j.ejvs.2016.07.082

Farah, B. Q.Ritti-Dias, R. M.Montgomery, P. S.Casanegra, A. I.Silva-Palacios, F. & Gardner, A. W. 2016. Sedentary behavior is associated with impaired biomarkers in claudicants. *Journal of vascular surgery : official publication, the Society for Vascular Surgery [and] International Society for Cardiovascular Surgery, North American Chapter*, 63 (3): 657-663. doi: 10.1016/j.jvs.2015.09.018

Figueiro, T. H.Arins, G. C. B.Santos, C.Cembranel, F.Medeiros, P. A.d'Orsi, E. & Rech, C. R. 2019. Association of objectively measured sedentary behavior and physical activity with cardiometabolic risk markers in older adults. *PloS one*, 14 (1): e0210861. doi: 10.1371/journal.pone.0210861

Garg, P. K.Tian, L.Criqui, M. H.Liu, K.Ferrucci, L.Guralnik, J. M.Tan, J. & McDermott, M. M. 2006. Physical activity during daily life and mortality in patients with peripheral arterial disease. *Circulation*, 114 (3): 242-248. doi: 10.1161/CIRCULATIONAHA.105.605246

Gerage, A. M.Benedetti, T. R.Farah, B. Q.Santana Fda, S.Ohara, D.Andersen, L. B. & Ritti-Dias, R. M. 2015. Sedentary Behavior and Light Physical Activity Are Associated with Brachial and Central Blood Pressure in Hypertensive Patients. *PLoS One*, 10 (12): e0146078. doi: 10.1371/journal.pone.0146078

Gerage, A. M.Correia, M. A.Oliveira, P. M. L.Palmeira, A. C.Domingues, W. J. R.Zeratti, A. E.Puech-Leao, P.Wolosker, N.Ritti-Dias, R. M. & Cucato, G. G. 2019. Physical Activity Levels in Peripheral Artery Disease Patients. *Arquivos brasileiros de cardiologia*, 113 (3): 410-416. doi: 10.5935/abc.20190142

Gerhard-Herman, M. D.Gornik, H. L.Barrett, C.Barshes, N. R.Corriere, M. A.Drachman, D. E.Fleisher, L. A.Fowkes, F. G.Hamburg, N. M.Kinlay, S. et al. 2016. 2016 AHA/ACC Guideline on the Management of Patients With Lower Extremity Peripheral Artery Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *Journal of the*

American College of Cardiology, doi: 10.1016/j.jacc.2016.11.007

Harris, T. J.Owen, C. G.Victor, C. R.Adams, R.Ekelund, U. & Cook, D. G. 2009. A comparison of questionnaire, accelerometer, and pedometer: measures in older people. *Medicine and science in sports and exercise*, 41 (7): 1392-1402. doi: 10.1249/MSS.0b013e31819b3533

Hupin, D.Roche, F.Gremeaux, V.Chatard, J. C.Oriol, M.Gaspoz, J. M.Barthelemy, J. C. & Edouard, P. 2015. Even a low-dose of moderate-to-vigorous physical activity reduces mortality by 22% in adults aged >/=60 years: a systematic review and meta-analysis. *British journal of sports medicine*, 49 (19): 1262-1267. doi: 10.1136/bjsports-2014-094306

Meneses, A. L.Farah, B. Q. & Ritti-Dias, R. M. 2012. Muscle function in individuals with peripheral arterial obstructive disease: A systematic review. *Motricidade*, 8 (1): 86-96. doi:

Montgomery, P. S. & Gardner, A. W. 1998. The clinical utility of a six-minute walk test in peripheral arterial occlusive disease patients. *Journal of the American Geriatrics Society*, 46 (6): 706-711. doi:

Ragazzo, L.Puech-Leao, P.Wolosker, N.de Luccia, N.Saes, G.Ritti-Dias, R. M.Cucato, G. G.Ferreira Kamikava, D. Y. & Zerati, A. E. 2021. Symptoms of anxiety and depression and their relationship with barriers to physical activity in patients with intermittent claudication. *Clinics*, 76 e1802. doi: 10.6061/clinics/2021/e1802

Russell, D. & Chase, J. D. 2019. The Social Context of Sedentary Behaviors and Their Relationships With Health in Later Life. *J Aging Phys Act*, 27 (4): 797-806. doi: 10.1123/japa.2018-0109

Salvo, G.Lashewicz, B. M.Doyle-Baker, P. K. & McCormack, G. R. 2018. A Mixed Methods Study on the Barriers and Facilitators of Physical Activity Associated with Residential Relocation. *J Environ Public Health*, 2018 1094812. doi: 10.1155/2018/1094812

Soares, A. H. G.Wendt, A.Crochemore-Silva, I.Martins, C.Barbosa, A. O.de Barros, M. V. G. & Tassitano, R. M. 2023. Prevalence and Sociodemographic Correlates of Meeting the 24-Hour Movement Guidelines Among Low-Income Brazilian Older Adults With Chronic Diseases. *Journal of aging and physical activity*, 31 (5): 756-764. doi: 10.1123/japa.2022-0200

Tebar, W. R.Ritti-Dias, R. M.Mota, J.Farah, B. Q.Saraiva, B. T. C.Damato, T. M. M.Delfino, L. D.Aguilar, B. A. S.Dos Santos, A. B.Silva, S. C. B. et al. 2020. Relationship between domains of physical activity and cardiac autonomic modulation in adults: a cross-sectional study. *Sci Rep*, 10 (1): 15510. doi: 10.1038/s41598-020-72663-7

von Elm, E.Altman, D. G.Egger, M.Pocock, S. J.Gotzsche, P. C.Vandenbroucke, J. P. & Initiative, S. 2014. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. *Int J Surg*, 12 (12): 1495-1499. doi: 10.1016/j.ijsu.2014.07.013

Zhao, M.Veeranki, S. P.Magnussen, C. G. & Xi, B. 2020. Recommended physical activity and all cause and cause specific mortality in US adults: prospective cohort study. *BMJ*, 370 m2031. doi: 10.1136/bmj.m2031

FIGURE LEGENDS

Figure 1. Flowchart of this study.

TABLES

Table 1. General characteristics of the patients included in this study (n=72).

Variables	Baseline	Follow-up	p
Sex (%, men)	68		-
Age (years)	65.7 ± 9.2	67.9 ± 9.1	<0.001
Weight (kg)	74.4 ± 13.4	73.5 ± 12.6	0.169
Height (m)	1.64 ± 0.08	1.64 ± 0.09	0.441
Body mass index (kg/m^2)	26.2 ± 4.3	27.1 ± 3.5	0.320
Accelerometer (min./day)	825 (121)	829 (115)	0.149
Sedentary behavior (min./week)	4205 (1118)	4501 (962)	0.001
Low-light physical activity (min./week)	2102 ± 725	1945 ± 664	0.014
MVPA (min./week)	84 (176)	39 (78)	<0.001
Ankle-brachial index	0.62 ± 0.19	0.53 ± 0.20	0.003
Diabetes (%)	42.9	47.9	0.375
Hypertension (%)	82.9	86.1	0.500
Dyslipidemia (%)	84.3	91.7	0.063
Obesity (%)	26.8	38.6	0.375
Coronary artery disease (%)	33.8	39.4	0.523
Cancer (%)	11.9	10.0	1.000
Stroke (%)	14.5	20.8	0.125
Heart failure (%)	11.9	14.7	0.607

Values are presented as mean ± standard deviation or median (interquartile range) and frequency.

Follow-up of 27 months (95%CI: 26-28 months). MVPA - Moderate vigorous physical activity.

Table 2. Prevalence of personal and environmental barriers to physical activity during a follow-up period in peripheral artery disease patients.

Barriers to Physical Activity	Baseline	Follow-up	p
Personal barriers			
Lack of time (%)	29.6	36.1	0.523
Lack of physical energy (%)	53.5	45.8	0.286
Not having anyone to accompany them (%)	40.8	26.4	0.013
Lack of money (%)	46.5	34.7	0.169
Other health conditions (%)	71.8	63.4	0.286
Lack of knowledge regarding the benefits of physical activity (%)	43.7	37.5	0.424
Pain induced by walking (%)	71.8	63.9	0.307
Needing to rest because of leg pain (%)	63.4	59.7	0.701
Being afraid of falling or aggravate the disease (%)	57.7	51.4	0.503
Environmental barriers			
Lack of security (%)	52.1	45.8	0.487
Inclement weather (%)	57.7	44.4	0.087
Lack of satisfactory places for the practice of physical activity (%)	62.0	43.7	0.024
Presence of obstacles that exacerbate leg pain (%)	84.5	71.8	0.078
Not having places to sit when feeling pain (%)	76.1	56.3	0.016
Streets are not flat (%)	42.3	53.5	0.175
Lack of green areas (%)	36.6	23.9	0.136
Difficulty in getting to a place where physical activity can be performed (%)	52.1	40.8	0.189

Moment 2 – Follow-up of 27 months (95%CI: 26-28 months).

Table 3. Analysis of follow-up personal and environmental barriers to physical activity in patients with PAD (n = 72).

Variables	Δ SB (min/week)		Δ LLPA (min/week)		Δ MVPA (min/week)	
	ß (SE)	P	ß (SE)	p	ß SE)	p
Personal barriers						
Lack of time (yes=1; No=0)	-11.8 (153.4)	0.94	2.1 (132.3)	0.98	-15.6 (31.4)	0.62
Lack of physical energy (yes=1; No=0)	-6.5 (148.0)	0.96	-9.1 (125.8)	0.94	47.5 (30.3)	0.12
Not having anyone to accompany them (yes=1; No=0)	170.7 (178.6)	0.34	-97.4 (156.8)	0.53	-8.9 (37.1)	0.81
Lack of money (yes=1; No=0)	**392.9 (159.7)**	**0.02**	**-327.4 (140.1)**	**0.02**	1.7 (34.8)	0.96
Other health conditions (yes=1; No=0)	-56.6 (143.0)	0.69	9.4 (124.2)	0.94	44.9 (29.4)	0.13
Lack of knowledge regarding the benefits of physical activity (yes=1; No=0)	151.2 (161.6)	0.35	-127.1 (143.7)	0.38	-0.5 (32.7)	0.98
Pain induced by walking (yes=1; No=0)	46.8 (148.1)	0.75	-48.8 (126.9)	0.70	13.1 (30.8)	0.67
Needing to rest because of leg pain (yes=1; No=0)	-17.7 (147.6)	0.90	46.0 (125.3)	0.71	1.2 (30.5)	0.97
Being afraid of falling or aggravate the disease (yes=1; No=0)	-50.7 (151.1)	0.74	39.5 (131.9)	0.77	-0.3 (30.8)	0.99
Environmental barriers						
Lack of security (yes=1; No=0)	-21.1 (148.0)	0.89	2.0 (127.6)	0.99	-10.9 (30.6)	0.72
Inclement weather (yes=1; No=0)	-170.8 (148.3)	0.25	105.0 (129.2)	0.42	1.7 (30.5)	0.95
Lack of satisfactory places for the practice of physical activity (yes=1; No=0)	-28.0 (152.9)	0.85	-30.4 (130.4)	0.81	16.8 (32.8)	0.61
Presence of obstacles that exacerbate leg pain (yes=1; No=0)	-285.7 (147.8)	0.06	196.4 (129.1)	0.13	18.9 (32.6)	0.56
Not having places to sit when feeling pain (yes=1; No=0)	44.7 (143.9)	0.75	-27.6 (123.7)	0.82	-0.1 (30.6)	0.99

Streets are not flat (yes=1; No=0)	180.4 (150.4)	0.23	-92.5 (130.9)	0.48	-35.6 (32.1)	0.27
Lack of green areas (yes=1; No=0)	-45.7 (171.5)	0.79	20.7 (146.9)	0.89	9.9 (36.6)	0.78
Difficulty in getting to a place where physical activity can be performed (yes=1; No=0)	132.8 (155.0)	0.39	-81.6 (133.8)	0.54	-9.2 (33.2)	0.78

Adjusted by sex, changes in ankle-brachial index, changes in total walking distance, and baseline values for each outcome respectively.

SB: Sedentary Behavior. LLPA: Low-light Physical Activity. MVPA: Moderate-Vigorous Physical Activity. ß (SE): regression coefficient (standard error).