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24-HOUR MOVEMENT BEHAVIORS AND MULTIDIMENSIONAL HEALTH IN PATIENTS PARTICIPATING IN THE AMPARO PHYSICAL RECONDITIONING PROGRAM

Comportamentos de Movimento de 24 Horas e Saúde Multidimensional em Pacientes Participantes do Programa de Recondicionamento Físico AMPARO

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Abstract: Introduction: Moderate-to-vigorous physical activity (MVPA), sedentary behavior, and sleep compose 24-hour movement behaviors (24hMB), which are associated with physical and mental health outcomes. Objective: to evaluate the effects of a structured Physical Reconditioning Program based on the AMPARO method on 24h-MB and multidimensional health outcomes in patients from a public university hospital. Methods: This longitudinal, non-randomized study included adult and older patients. Movement behaviors were self-reported. Quality of life was assessed using a validated questionnaire, and physical fitness was evaluated through walking, handgrip strength, and mobility tests. Pre- and post-intervention comparisons were conducted ($\alpha = 0.05$). Results: Twenty-seven patients participated (52.07 ± 14.86 years; 51.9% male). MVPA increased ($p < 0.001$) and sedentary time decreased ($p = 0.003$). Physically active participants showed improvements in physical fitness, muscle mass, anxiety/depression and pain symptoms, health status, and well-being ($p < 0.01$). Conclusion: The AMPARO program was safe and effective in improving movement behaviors and multidimensional health.
Keywords: Physical Activity, Sedentary Behavior, Comprehensive Health Care, Physical Education, Unified Health System.

Resumo Introdução: A atividade física moderada a vigorosa (AFMV), o comportamento sedentário e o sono compõem os comportamentos de movimento de 24 horas (CM24h), os quais estão associados a desfechos de saúde física e mental. Objetivo: avaliar os efeitos de um

Programa de Recondicionamento Físico estruturado com base no método AMPARO sobre os comportamentos de movimento de 24 horas e os desfechos de saúde multidimensional em pacientes de um hospital universitário público. Métodos: Estudo longitudinal, não randomizado, com pacientes adultos e idosos. Os comportamentos de movimento foram autorreferidos. A qualidade de vida foi avaliada por meio de questionário validado, e a aptidão física foi mensurada por testes de caminhada, força de preensão manual e mobilidade. Foram realizadas comparações pré e pós-intervenção ($\alpha = 0,05$). Resultados: Participaram 27 pacientes (52,07 ± 14,86 anos; 51,9% homens). Observou-se aumento da AFMV ($p < 0,001$) e redução do tempo sedentário ($p = 0,003$). Participantes fisicamente ativos apresentaram melhorias na aptidão física, massa muscular, sintomas de ansiedade/depressão e dor, estado de saúde e bem-estar ($p < 0,01$). Conclusão: O programa AMPARO mostrou-se seguro e eficaz na melhoria dos comportamentos de movimento e da saúde multidimensional.

Palavras-chave: Atividade Física, Comportamento sedentário, Assistência Integral à Saúde, Educação Física, Sistema Único de Saúde.

INTRODUÇÃO

Throughout the centuries, there has been a marked growth in sedentary behavior (SB). SB is characterized as any waking activity performed in a seated or reclined position with an energy expenditure ≤ 1.5 metabolic equivalents (METs) (Biddle *et al*., 2018; Rezende *et al*., 2022). Alongside SB and sleep, light-intensity physical activity (LPA) and moderate-to-vigorous physical activity (MVPA) constitute the 24-hour movement behavior framework (24h-MB), which highlights the integrated evaluation of physical activity, sedentary time, and sleep across the day (Lee *et al*., 2024). The rising predominance of sedentary lifestyles, together with declining levels of daily physical activity, has been associated with adverse health outcomes, including reduced functional capacity, poorer quality of life, and increased burden of chronic conditions (Silveira et al., 2022; Miranda et al., 2021; Faria et al., 2020).

In addition, psychological factors such as stress, anxiety, and depression are closely linked to movement behaviors, reinforcing the need for integrated approaches that consider both physical and psychosocial health domains (Piątkowska-Chmiel et al., 2023; Khanna; Welch; Rehman, 2022; Rezende *et al*., 2024). Comprehensive and coordinated care enhances therapeutic effectiveness and favors sustained health benefits. Within the Brazilian public and community health system, physical education professionals (PEPs) assume a central role in encouraging higher physical activity levels and reducing sedentary behavior (Miranda et al., 2023).

In this scenario, there is a pressing need for studies that examine the effectiveness of Physical Reconditioning Programs (PRP) on physical, functional, and psycho-emotional health outcomes in patients receiving outpatient care from physical education services within public

university hospitals. Accordingly, the present study aimed to evaluate the effects of a structured Physical Reconditioning Program based on the AMPARO method on 24h-MB and multidimensional health outcomes in patients from a public university hospital.

MATERIAL AND METHODS

The present study was designed as a quasi-experimental longitudinal study without a parallel control group. The sample consisted of adult and older adult patients aged 20 to 85 years who were enrolled in the Physical Reconditioning Program (PRP). The intervention sessions were carried out at the Rehabilitation Center. This study is part of a broader research project approved by the Research Ethics Committee of the Clinical Hospital of the Federal University of Triângulo Mineiro (CH-FUTM), under opinion number 5.695.381 and CAAE: 63185922.5.0000.8667.

All patients linked to the PRP were invited to participate in the study. Following the assessments, the physical education professional, along with program residents and scholarship students, evaluated each patient's eligibility to initiate the program. Inclusion criteria consisted of: (1) being formally registered with the multidisciplinary unit; (2) having undergone medical screening and referral to the physical education service; (3) presenting minimum health conditions necessary to engage in moderate-to-light intensity physical activity and exercise; and (4) agreeing to comply with the PRP requirements, including participation in 36 supervised sessions and completion of four multidimensional and physical assessments. Patients were excluded from the study if they failed to complete the program due to health-related complications or accumulated more than three unexcused absences.

The required sample size was estimated a priori using the StatCalc tool from EpiInfo™ software (version 7.2.0.1; Centers for Disease Control and Prevention, USA), considering a 95% confidence level, 80% statistical power, and a 5% margin of error. The estimation was based on the expected change in moderate-to-vigorous physical activity (MVPA), which represents a central outcome within the 24-hour movement behavior framework and a primary target of the intervention. However, due to the real-world clinical nature of the study and adherence requirements for completing all intervention phases, the final sample size was determined by participant retention. Therefore, the findings should be interpreted with caution, as exploratory, and primarily hypothesis-generating.

Patient assessments included the administration of standardized questionnaires and the

collection of kinanthropometric measurements, conducted on the same day as the patient's scheduled medical consultation. Health status, comorbidities, medication use, and laboratory test results were obtained from the hospital's electronic health record system - the University Hospital Management Application (UHMA) of CH-FUTM. All questionnaires were administered in interview format to ensure accuracy and consistency of responses. Anthropometric assessments were conducted by the same group of trained and qualified evaluators to minimize interrater variability.

Prior to data collection, the researchers provided a detailed explanation of the study procedures to each participant. Following this orientation, participants were invited to begin the evaluation process, which included the assessment of sociodemographic characteristics, health-related physical fitness, and psycho-emotional capacities. Sociodemographic data were collected to identify and characterize the study population. Physical fitness was assessed using validated field-based tests for the Brazilian adult population, encompassing evaluations of cardiorespiratory fitness, muscular strength, local muscular endurance, and lower limb power.

The 24-hour MB were assessed in an integrated manner, including MVPA expressed as weekly average (minutes/week), total sedentary time, screen time, and daily sleep duration (hours/day). Two instruments were used to assess physical activity levels: the International Physical Activity Questionnaire (IPAQ) – short form (Matsudo et al., 2001), and the Physical Activity Vital Sign (PAVS) developed by the American College of Sports Medicine (ACSM, 2021), both of which evaluate frequency (days per week) and duration (minutes per session).

MVPA was categorized using the threshold of ≥150 minutes per week, in line with the Brazilian Physical Activity Guidelines (Brasil, 2021) and the recommendations of the World Health Organization (WHO, 2018; 2020). Sedentary behavior was classified as high when total daily sedentary time exceeded 7 hours, according to criteria proposed by Park et al. (2018). Screen time was considered excessive when greater than 8 hours per day, given its documented effects on physical and mental health (Kazi, Shaikh, & Chawla, 2024). Sleep duration was classified based on the WHO recommendation of 8 hours per night (WHO, 2020).

Quality of life correlates were evaluated using selected items from the EQ-5D instrument, employing the Portuguese-validated version described by Ferreira et al. (2014). The anxiety/depression and pain/discomfort dimensions were specifically analyzed through a 5-point Likert response scale. In addition, participants rated their overall health status using a visual analog scale ranging from 0 to 100.

The outcome assessed was well-being, measured using the Well-Being Scale (WBS)

developed by Hooper et al. (1995). This instrument evaluates the individual's perception of fatigue, muscle soreness, sleep quality, and stress. Responses are recorded on a 7-point Likert scale, where for the variables *stress*, *fatigue*, and *muscle soreness*, a score of 1 indicates "very low" and 7 indicates "very high". For *sleep quality*, the scale is inverted: a score of 1 corresponds to "very good" and 7 to "very poor".

Physical fitness assessments were conducted immediately following the multidimensional evaluations and included the 6-Minute Walk Test (6MWT), the Sit and Rise Test (SRT), handgrip strength test, and the countermovement jump (CMJ). The 6MWT was performed in a 30-meter corridor, following the Standard Operating Procedure published by HC-UFTM. The SRT was applied according to the protocol proposed by Araújo (1999), in which participants received a score from 0 to 5 for sitting and from 0 to 5 for rising, with a total score ranging from 0 to 10.

Handgrip strength was measured using the dominant hand while the participant was seated with the elbow flexed at 90 degrees. The best result of three attempts was recorded using a Crown® hand dynamometer, with results expressed in kilograms of force (kgf). Lower limb muscle power was assessed using the countermovement jump (CMJ). The "My Jump" mobile application, validated by Balsalobre-Fernandez et al. (2015), was used to capture and analyze the jump. Participants performed the jump from a standing position at a distance of three meters from the camera, and the jump height (in centimeters) was recorded.

After the initial diagnostic assessment, participants began their exercise sessions following the PRP protocol, based on the AMPARO method (Miranda et al., 2023). The full duration of the study was 12 months, and the PRP intervention lasted 36 weeks. Multidimensional variables were reassessed every 12 sessions, including a baseline assessment and three follow-up evaluations.

Data Analysis

Data entry and tabulation were initially performed using Google Sheets (Google® Application, Mountain View, California, USA), with double data entry and verification procedures to ensure accuracy. Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) for Windows, version 26.0 (IBM Corporation®, New York, USA), and Jamovi (The Jamovi Project, version 2.5.3, 2024).

To assess data distribution, the Kolmogorov-Smirnov or Shapiro-Wilk tests were applied, along with evaluations of skewness, kurtosis, and histogram interpretation. Based on

the results of these assessments, appropriate parametric or non-parametric tests were selected.

Changes in the classification categories of 24h-MB were analyzed using McNemar's test (Dancey; Reidy; Rowe, 2017). Subsequently, cluster analysis was employed to group patients who increased their physical activity levels according to the weekly MVPA recommendation of ≥150 minutes. Descriptive statistics for quantitative variables (discrete and continuous) included means, medians, standard deviations, interquartile ranges, and range (minimum and maximum values) (Dancey; Reidy; Rowe, 2017).

To evaluate differences between baseline and post-intervention, patients were divided into two groups: (1) those who did not meet the MVPA recommendation, considered the control group, and (2) those who achieved the recommended MVPA levels. All comparisons were adjusted for age, sex, and diagnosed health condition. Effect sizes were calculated using the digital tool developed by Lenhard and Lenhard (2016). The number of statistical tests performed increases the risk of Type I error, potentially inflating the likelihood of false-positive findings. Consequently, the results should be interpreted with caution, particularly for outcomes with marginal statistical significance. Emphasis should be placed on the overall pattern of findings and effect sizes rather than isolated p-values. The significance level for all statistical tests was set at $p < 0.05$ ($\alpha = 0.05$).

RESULTS

A total of 31 patients regularly enrolled in the Physical Reconditioning Program (PRP), supervised by the Physical Education team at CH-FUTM, were initially included in the study. Of these, six participants either did not complete the 36-session intervention or became ineligible during one or more assessment phases. Consequently, the final sample comprised 27 patients, with a mean age of 52.07 ± 14.86 years, of whom 14 (51.9%) were male. Approximately 44% of the participants presented with neuromuscular conditions, resulting from either congenital syndromes or traumatic events. The remaining individuals were classified as having cardiovascular, systemic, or metabolic diseases, or post-COVID-19 sequelae, the latter predominantly characterized by muscle weakness and persistent fatigue.

There was a significant increase in MVPA time observed throughout the PRP sessions with the implementation of the AMPARO method ($p < 0.001$). Figure 1 clearly shows that more than half of the participants had a weekly MVPA time of zero at the first assessment in Moment 1 (M1).

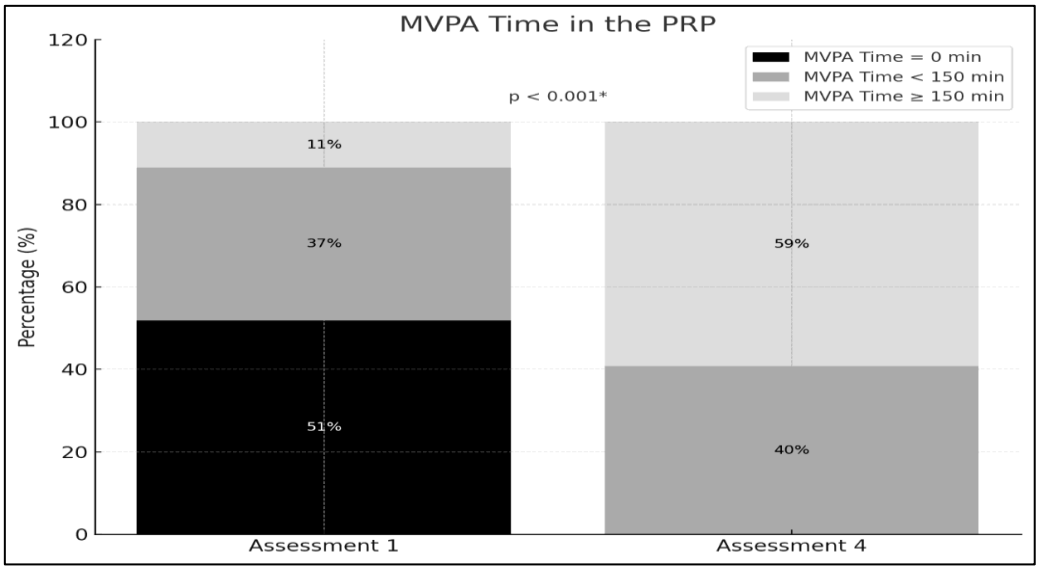

Figure 1: Variation in MVPA Classification Over the Course of the PRP.
McNemar test; MVPA: Moderate-to-Vigorous Physical Activity; min: minutes; M 1: Assessment before PRP; M4: Final assessment of the PRP.

All patients reported a value greater than zero for weekly MVPA time by the end of the program. Furthermore, most participants (59.3%) met the recommended level of MVPA (≥150 minutes per week), in accordance with the guidelines established by the Brazilian Ministry of Health (Brasil, 2021) and the World Health Organization (WHO, 2020; 2018).

Sedentary time and screen time classifications were also modified following the AMPARO-based intervention within the PRP. By the final evaluation (Moment 4), the proportion of patients who reported spending more than 7 hours per day in sitting or reclining positions during waking hours declined from 66.7% to 25.9%. Similarly, the percentage of participants reporting more than 8 hours of daily screen exposure decreased from 63.0% to 40.7%. In contrast, no significant changes were observed in sleep duration. The proportion of patients reporting 8 or more hours of sleep per day remained relatively stable throughout the intervention, varying between 55% and 59%.

The variation in the prevalence of patients who increased their MVPA time and/or reduced sedentary behavior was confirmed through the contingency analysis presented in Table 1. A statistically significant difference was observed for weekly MVPA time ($p = 0.013$) and sedentary behavior ($p = 0.003$), indicating that patients began to meet the recommended MVPA levels while simultaneously reducing their sedentary status. Conversely, no significant changes were observed in screen time or sleep duration throughout the intervention.

Following the evaluation of 24h-MB, patients were categorized into two groups for inferential analyses. The control group consisted of individuals who did not meet the recommended threshold of 150 minutes of MVPA per week (n = 16; 59.3%). The second group included patients who achieved the MVPA recommendation, defined as engaging in ≥150 minutes of MVPA per week (n = 11; 40.7%).

	MVPA time – Assessment 4		
MVPA time – Assessment 1	**≥150 min)**	**<150 min)**	**p***
≥150 min	4 (14.8%)	2 (7.4%)	0.013
<150 min	12 (44.4%)	11 (33.3%)	
Total	16 (59.3%)	11 (40.7%)	
SB time - Assessment 1	**SB time - Assessment 4**		**p***
	<7h	**≥7h**	0.003
<7h	8 (29.6%)	1 (3.7%)	
≥7h	12 (44.4%)	6 (22.2%)	
Total	20 (74.1%)	7 (25.9%)	
Screen time - Assessment 1	**Screen time - Assessment 4**		
	<8h	**≥8h**	**p***
<8h	5 (18.5%)	5 (18.5%)	0.21
≥8h	11 (40.7%)	6 (22.2%)	
Total	16 (59.3%)	11 (40.7%)	
Sleep time – Assessment 1	**Sleep time – Assessment 4**		
	≥8h	**<8**	**p***
≥8h	10 (37.0%)	5 (18.0%)	1
<8	6 (22.2%)	6 (22.2%)	
Total	16 (59.9%)	11 (40.7%)	

Table 1. Variation in the Prevalence of Movement Behaviors Throughout the PRP.
*McNemar test; MVPA: Moderate-to-Vigorous Physical Activity; min: minutes.

Overall, patients demonstrated improvements in physical fitness following the implementation of the AMPARO method within the PRP. After adjusting for age, sex, and type of disease, statistically significant improvements were observed across multiple fitness outcomes: patients walked longer distances in the 6-Minute Walk Test (6MWT) ($p < 0.001$), exhibited greater control and stability in the Sit and Rise Test (SRT) ($p < 0.001$), increased static handgrip strength ($p = 0.002$), improved lower limb power as measured by the Countermovement Jump (CMJ) ($p < 0.001$), and showed an increase in skeletal muscle mass ($p < 0.001$). No significant changes were observed in Body Mass Index (BMI) or body fat percentage (%).

Physical tests (n = 27)	Assess 1		Assess 4		
	Mean	**SD(±)**	**Mean**	**SD(±)**	***p****
6MWT (m)	470.85	81.61	539.74	55.10	<0.001
Handgrip strength (kg/f)	22.85	8.01	25.19	8.70	0.002
SRT total	4.22	2.00	7.63	1.90	<0.001
CMJ (My jump - cm)	11.82	4.40	15.86	6.74	<0.001
BMI(kg/m²)	29.42	6.80	29.37	6.50	0.887
Body fat (%)	29.37	6.50	26.66	12.58	0.07
SMM (kg)	30.02	6.50	33.34	6.87	<0.001

Table 2. Changes in Physical Capacities and Physical Fitness of Patients Throughout the PRP.
* Paired t-test adjusted for age, sex, and disease type; 6MWT: 6-Minute Walk Test; SD: standard deviation; SRT: Sit and Rise Test; CMJ: Countermovement Jump; BMI: Body Mass Index; SMM: Skeletal Muscle Mass; Assess 1: Assessment before the PRP; Assess 4: Final assessment of the PRP.

Table 3 shows that inactive patients (control group) did not exhibit significant improvements in physical fitness. In contrast, patients who met the MVPA recommendation after completing the 36 sessions of the PRP became more physically active and demonstrated significant improvements in health-related physical fitness components.

Table 3: Changes in Physical Capacities and Physical Fitness of Patients Throughout the PRP, Controlled by Comparison Between Physically Inactive and Active Patient Groups.

Physical tests (n = 27)	**Control group (< 150 min MVPA) (n = 11)**			**Physical Active group (≥150 min MVPA) (n = 16)**		
	Assess 1	**Assess 4**	**p**	**Assess 1**	**Assess 4**	***p****
	Média (±DP)	**Média (±DP)**		**Média (±DP)**	**Média (±DP)**	
6MWT (m)	523.09 (55.85)	540,45 (56,5)	0.137	434.9 (78.0)	539.2 (55.9)	<0.001
Handgrip strength (kg/f)	24.00 (6.2)	23.36 (6.6)	0.244	22.06 (9.2)	26.44 (9.9)	<0.001
SRT total	5.09 (1.5)	5.73 (1.4)	0.046	3.63 (2.2)	8.94 (2.0)	<0.001
CMJ (My jump - cm)	11.34 (3.4)	12.11 (3.4)	0.410	12.14 (5.0)	18.44 (7.1)	<0.001
BMI(kg/m²)	28.7 (5.4)	28.3 (5.5)	0.472	29.9 (7.8)	30.1 (7.1)	0.094
Body fat (%)	28.3 (5.5)	26.6 (11.9)	0.576	30.1 (7.1)	26.6 (17.7)	<0.001
SMM (kg)	30.23 (6.3)	30.40 (6.1)	0.324	29.8 (6.9)	35.3 (6.8)	<0.001

* Paired t-test adjusted for age, sex, and disease type. 6MWT: 6-Minute Walk Test; SD: standard deviation; SRT: Sit and Rise Test; CMJ: Countermovement Jump; BMI: Body Mass Index; SMM: Skeletal Muscle Mass; Assess 1: Assessment before the PRP; Assess 4: Final assessment of the PRP.

Following the PRP sessions and the application of the AMPARO method, patients showed significant improvements in anxiety/depression scores ($p < 0.001$), pain/discomfort ($p < 0.001$), and self-perceived health status ($p < 0.001$). Regarding well-being, there was a

significant improvement in sleep quality (p = 0.001), reduced perception of muscle soreness (p < 0.001), and an increase in overall well-being scores (p = 0.003). Table 4 shows that inactive patients (control group) did not experience significant improvements in anxiety/depression, pain/discomfort, health perception, or any domain of the well-being scale. In contrast, patients who met the MVPA recommendation after the 36 PRP sessions reported lower levels of anxiety/depression, less pain/discomfort, improved perceived health, reduced stress, fatigue, and muscle soreness, and an overall enhancement in general well-being.

Table 4: Changes in Quality of Life (QoL) Correlates and Well-Being of Patients Throughout the PRP.

	Control group (< 150 min MVPA)			**Physical Active group (≥150 min MVPA)**		
	Assess 1	**Assess 4**	**p**	**Assess 1**	**Assess 4**	***p***
QoL	**Mean (±SD)**	**Mean (±SD)**		**Mean (±SD)**	**Mean (±SD)**	
Anx/Dep score	3.5 (1.2)	3,2 (0,6)	0.391	3.80 (1.3)	1.40 (0.8)	<0.001
Pain score	2.3 (1.1)	2,1 (1,0)	0.192	3.25 (1.2)	1.56 (0.8)	0.001
Health state	60.45 (10.1)	65.9 (12.4)	0.160	55.0 (16.0)	79.0 (4.9)	<0.001
Well-Being						
Sleep	3.18 (1.4)	2.82 (1.3)	0.397	2.63 (1.8)	2.44 (1.5)	0.628
Stress	3.45 (1.2)	3.18 (1.2)	0.192	4.81 (2.2)	4.13 (1.4)	0.025
Fatigue	2.91(1.2)	2.82 (1.2)	0.779	4.13 (1.4)	1.8 (1.1)	<0.001
Pain SMM score	3.64 (2.2)	3.27 (1.7)	0.307	2.94 (1.7)	2.5 (1.4)	0.029
Total Well-Being	13.18 (4.4)	12.09 (3.7)	0.16	14.5 (4.9)	9.56 (4.2)	0.001

* Paired t-test adjusted for age, sex, and disease type.
QoL: Quality of Life; SD: standard deviation; Anx: Anxiety; Dep: Depression; Dis: Discomfort; Assess 1: Assessment before the PRP; Assess 4: Final assessment of the PRP.

DISCUSSION

The findings of this study demonstrate that the Physical Reconditioning Program (PRP), structured based on the AMPARO method, was effective in promoting significant changes in 24h-MB, particularly by increasing MVPA and reducing SB. These results are consistent with current literature, which highlights supervised and integrated interventions as effective strategies for improving both physical and mental health in populations with multiple comorbidities (Hossian *et al*., 2025; Werneck *et al*., 2020).

The implementation of the PRP based on the AMPARO method suggests that structured and supervised exercise interventions can be feasibly integrated into routine care within a public university hospital. The number of patients assisted, and the volume of outpatient sessions reflect the program's operational feasibility; however, these indicators should be interpreted cautiously, as they do not necessarily translate into effectiveness at a population level. Importantly, the integration of physical education professionals within multiprofessional teams appears to support the delivery of structured interventions in clinical settings.

Nonetheless, the extent to which this model can be scaled and replicated across different healthcare contexts remains unclear. Future studies should evaluate its external validity, cost-effectiveness, and long-term sustainability using more rigorous methodological designs. The present findings indicate that supervised and structured physical activity interventions, such as those examined in this study, may play a relevant role in improving movement behaviors and multidimensional health outcomes within public healthcare settings. These results align with existing evidence suggesting that organized exercise programs can support health promotion and the management of noncommunicable chronic diseases. Nevertheless, caution is warranted when extrapolating these findings to broader healthcare contexts. The absence of a control group and the limited sample size restrict the strength of inference, and the extent to which such interventions can be effectively implemented and sustained at scale within the public health system remains to be determined.

Programs such as the *Academia da Saúde*, implemented across several Brazilian municipalities, illustrate the feasibility and beneficial impact of community-based physical activity initiatives in increasing activity levels, decreasing sedentary behavior, and improving psychosocial outcomes among the population (Oliveira et al., 2021; Santos et al., 2023). Evaluation studies of these programs indicate that participants experience enhanced quality of life, improved control of metabolic conditions, and greater overall well-being, reinforcing the importance of expanding and consolidating such initiatives as integral components of the Unified Health System (Hallal et al., 2010; Silva et al., 2021).

The increase in MVPA levels observed in more than 59% of the participants, together with the reduction in sedentary time, corroborates previous evidence demonstrating a strong relationship between adequate movement behaviors and improvements in physical fitness, body composition, and mental health (Bogale et al., 2024; Caixeta et al., 2024). Studies employing comparable designs have reported that, in line with recommendations from the Brazilian Ministry of Health, regular engagement in physical activity is associated with better functional

capacity, greater muscular strength, and enhanced emotional well-being (Seo et al., 2021; Manferdelli et al., 2019).

In the present investigation, physically active participants exhibited significant gains in physical performance, including handgrip strength, local muscular endurance, lower-limb power, and distance achieved in the 6MWT. These results further support the role of physical activity as a fundamental determinant of functional health, especially among clinical and older populations (Gomes et al., 2014).

An additional noteworthy finding was the significant enhancement in subjective indicators of quality of life and well-being. Participants who achieved the recommended levels of MVPA reported lower levels of anxiety, depression, and pain/discomfort, as well as improvements in sleep quality and perceived overall health. These findings align with existing evidence indicating that regular physical exercise acts as a modulator of mood and systemic inflammatory processes, thereby potentially contributing to the management of psycho-emotional symptoms in individuals with chronic conditions (Brunet et al., 2021; Caetano et al., 2022). Furthermore, the findings indicated that participation in the PRP was both feasible and safe, including individuals presenting complex clinical conditions, such as neuromuscular and cardiovascular sequelae. This aspect is especially relevant within public hospital environments, where structured physical rehabilitation programs are frequently limited or insufficiently integrated into the broader healthcare system (Botero et al., 2021).

Previous evidence suggests that structured physical activity interventions may be associated with improvements in health system efficiency, including potential reductions in healthcare utilization and increased functional independence (Miranda et al., 2023; Brasil, 2020). However, such outcomes were not directly assessed in the present study and should therefore be interpreted cautiously. While these findings are conceptually aligned with the principles of comprehensive care within Brazil's Unified Health System (SUS), the extent to which such interventions can produce system-level impacts remains to be established through studies specifically designed to evaluate economic and healthcare utilization outcomes.

Although the study yielded promising findings, certain limitations must be acknowledged, including its non-randomized design and relatively small sample size. Participants were categorized post hoc into two groups based on their MVPA levels at the final assessment (≥150 min/week vs. <150 min/week). This classification was performed for exploratory analytical purposes and does not represent pre-defined or randomized groups. The assessment of movement behaviors was based on self-reported instruments, which represent

other limitations of the present study. Self-report measures are subject to recall bias and social desirability bias, potentially leading to overestimation of physical activity levels and underestimation of sedentary behavior. This limitation is particularly relevant in clinical populations, where perception of activity intensity and duration may differ from objective measures. Despite these limitations, validated instruments such as the IPAQ and the PAVS were used, which are widely applied in epidemiological and clinical research. Moreover, self-reported measures remain feasible and practical tools in real-world healthcare settings, especially within public health systems where objective monitoring devices are not routinely available.

The findings of this study indicate that the PRP effectively produced meaningful changes in 24-hour MB, particularly through significant increases in MVPA and reductions in sedentary time. These results are consistent with the current body of evidence, which underscores that structured and supervised interventions represent effective strategies for enhancing both physical and mental health among individuals living with multiple health conditions (Biddle et al., 2018; Werneck et al., 2021).

The results of this study highlight the relevance of incorporating supervised physical activity and exercise programs - such as those structured according to the AMPARO method - into Brazil's Unified Health System. These initiatives should be planned, coordinated, and delivered by qualified physical education professionals, residents, and undergraduate students. Programs such as Academia da Saúde, already implemented in several Brazilian municipalities, exemplify the feasibility and beneficial impact of these strategies. Such initiatives contribute to increasing population-level physical activity, decreasing sedentary behavior, and improving psychosocial health outcomes (Oliveira et al., 2021; Santos et al., 2023).

By incorporating PEPs into multiprofessional healthcare teams, these programs can deliver interventions tailored to local contexts, consistently prioritizing collective health promotion, equitable care, and the implementation of comprehensive healthcare, in accordance with the National Health Promotion Policy. Evaluation studies of such initiatives have indicated that users report improvements in quality of life, better control of metabolic conditions, and enhanced overall well-being (Hallal et al., 2010; Silva et al., 2021).

The observed increase in MVPA levels among more than 59% of the participants, together with the reduction in sedentary behavior, is consistent with previous evidence. Prior investigations have demonstrated a strong relationship between adequate movement behaviors

and favorable outcomes in physical fitness, body composition, and mental health (Bogale et al., 2024; Manferdelli et al., 2019).

Another important aspect was the significant improvement in quality of life and well-being indicators. Participants who achieved the MVPA recommendation reported lower levels of anxiety, depression, and pain/discomfort, as well as improved sleep quality and overall health perception (Botelho et al., 2021). These findings are in line with existing evidence that regular physical exercise functions as a regulator of mood and the body's inflammatory response, which can be crucial for managing psycho-emotional symptoms in individuals with chronic conditions (Brunet et al., 2021; Caetano et al., 2022). This perspective is fully aligned with the principles of comprehensive healthcare established by the SUS and reinforces the strategic role of physical education professionals within multiprofessional teams

CONCLUSION AND FINAL CONSIDERATIONS

This quasi-experimental longitudinal study demonstrated positive changes in 24h-MB following participation in a structured PRP based on the AMPARO method, including increases in MVPA and reductions in sedentary time. Participants who reached recommended levels of physical activity exhibited improvements in physical fitness, functional performance, and multidimensional health outcomes, such as well-being and quality of life. These findings should be interpreted with caution, considering the study design and sample size, and should be viewed as indicative of intervention-related changes rather than definitive evidence.

Future studies using controlled designs and larger samples are warranted to confirm these findings and further investigate the effectiveness and scalability of the AMPARO method in public health settings. Beyond delivering structured exercise sessions, the program integrates multidimensional and physical assessments that serve as the basis for individualized guidance. This structured approach supports progressive increases in physical activity while enhancing physical capacities, quality of life, and overall well-being.

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