

## Article

# Relationship of Nutritional Status and Physical Activity Level with Dynamic Postural Balance in Young Adults

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**Abstract:** The increasing prevalence of excess body weight and physical inactivity among young adults raises concerns about their impact on dynamic postural control. This study aimed to examine the relationship of nutritional status and physical activity level (PAL) with dynamic postural balance in young adults. A cross-sectional study was conducted with 189 young adults (81 females and 108 males; aged 18–29 years). Nutritional status was determined using BMI, and PAL was assessed with the IPAQ-SF. Dynamic postural balance was measured using the Modified Star Excursion Balance Test (SEBTm) in three directions: anterior, posteromedial (PM), and posterolateral (PL). Regression analysis showed no significant associations in the anterior direction (adjusted model by sex  $R^2 = 0.051$ ;  $p > 0.05$ ). However, for the PM direction, the adjusted model ( $R^2 = 0.289$ ) identified nutritional status ( $B = 2.784$ ;  $p = 0.015$ ), PAL ( $B = 2.962$ ;  $p = 0.011$ ), and sex ( $B = 8.248$ ;  $p < 0.001$ ) as significant predictors of postural balance performance. Similarly, in the PL direction, the adjusted model ( $R^2 = 0.275$ ) confirmed significant associations for nutritional status ( $B = 2.413$ ;  $p = 0.004$ ), PAL ( $B = 4.203$ ;  $p = 0.031$ ), and sex ( $B = 7.712$ ;  $p < 0.001$ ). These findings suggest that both nutritional and behavioral factors contribute to dynamic balance performance in young adults, particularly in directions with greater postural demands.

**Keywords:** postural balance; physical activity; nutritional status; young adults; postural control



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## 1. Introduction

In the 21st century, overweight and obesity have reached epidemic levels in many developed and developing countries [1,2]. According to the *World Obesity Atlas*, by 2025, 27% of adult females and 18% of adult males are projected to be obese [3]. In Latin

America, the outlook is equally concerning, with Chile ranking among the ten countries with the highest prevalence of overweight and obesity. According to recent data from the Organisation for Economic Co-operation and Development (OECD), 74% of the Chilean adult population is classified as overweight or obese [4,5].

This alarming rise in obesity is closely associated with increasing levels of physical inactivity [3]. The World Health Organization (WHO) reports that one in four adults globally fails to meet recommended physical activity levels, positioning physical inactivity as a leading contributor to global mortality [6]. In Chile, the situation is even more critical, with national data indicating that only 18.7% of adults meet WHO activity guidelines, leaving over 80% of the population physically inactive [7].

Both excess weight and physical inactivity are recognized risk factors for numerous chronic non-communicable diseases, including cardiovascular disease, type 2 diabetes, and metabolic syndrome [8–10]. Their coexistence exacerbates adverse health outcomes through mechanisms such as increased systemic inflammation and physiological burden [11]. Beyond disease risk, these conditions may compromise physical function. Inactivity-related muscle mass reduction, combined with biomechanical and neuromotor disruptions caused by excess adiposity, can impair mobility, coordination, and motor performance [12]. These deficits are particularly evident in tasks that demand postural control and dynamic stability, suggesting a potential link between these modifiable lifestyle factors and balance dysfunction [12,13].

Postural balance refers to the ability to control the body's center of gravity in relation to its base of support, both in static conditions (e.g., standing) and during dynamic movements (e.g., walking) [14]. This ability is fundamental for the effective execution of daily tasks and optimal motor performance [12,15]. In young adults, the assessment of postural balance—particularly under dynamic conditions—is important for identifying neuromuscular alterations potentially influenced by lifestyle factors such as physical inactivity and excess body weight.

One of the most widely used tools for evaluating dynamic postural balance is the Star Excursion Balance Test (SEBT) [16]. This test requires the participant to maintain a single-leg stance while reaching with the contralateral leg in eight directions. A simplified and validated version—the Modified Star Excursion Balance Test (SEBTm)—focuses on the anterior, posterolateral (PL), and posteromedial (PM) directions, which have shown to be the most reliable indicators of dynamic postural control [16].

Both excess body weight and physical inactivity have been independently associated with impairments in postural balance, and their combined presence may further exacerbate neuromuscular limitations. Several studies have reported that individuals with overweight or obesity perform worse in balance tasks compared to their normal-weight peers [17–20], although most of this evidence comes from static assessments. In contrast, studies specifically targeting young adults and dynamic balance are scarce. Similarly, physical inactivity has received limited attention as a determinant of postural balance. While evidence in older adults supports the positive impact of regular physical activity on balance control [21–23], comparative analyses between physically active and inactive young adults remain under-explored. In a recent study involving children through multiple linear regressions found that the combined presence of excess weight and physical inactivity negatively affected dynamic postural balance [13], underscoring the need to investigate this relationship in other populations.

Given the rising prevalence of overweight, obesity, and physical inactivity among young adults and the limited evidence regarding their impact, this study aimed to examine the relationship of nutritional status and physical activity level (PAL) with dynamic postural balance in this population.

## 2. Materials and Methods

### 2.1. Design

This descriptive, observational, and cross-sectional study was conducted in accordance with the STROBE guidelines [24] and approved by the Universidad Santo Tomás Research Ethics Board (approval number 7819). Participants were recruited through digital invitations distributed via institutional email lists, social media platforms, and classroom announcements in higher education institutions in the Maule region (Chile), including universities, professional institutes, and technical training centers. The recruitment strategy was non-probabilistic and based on convenience sampling. Interested individuals contacted the research team and were screened for eligibility. Written informed consent was obtained from all participants prior to data collection.

### 2.2. Participants

The sample size was calculated using GPower\* software version 3.1 (Universität Düsseldorf, Germany). Based on prior research, which identified moderate associations between anthropometric and behavioral factors with postural balance in youth populations [13], a medium effect size ( $f^2 = 0.15$ ) was assumed for a multiple linear regression with three predictors (nutritional status, PAL, and sex). Using an alpha level of 0.05 and a power of 0.95, the minimum sample size required was 119 participants. To increase statistical power and allow for subgroup analyses, a final sample of 189 participants was included.

A total of 81 females and 108 males aged 18 to 29 years voluntarily participated in the study. All were currently enrolled in undergraduate or technical education programs. Exclusion criteria included any musculoskeletal injury in the lower limbs within the previous six months, diagnosed vestibular or visual impairments, or the need for assistive devices for ambulation.

Regarding general health, participants self-reported the absence of chronic diseases or conditions that could affect postural control (e.g., neurological disorders, diabetes, recent surgeries). Although no formal medical screening was performed, participants were instructed to report any medical conditions that might compromise their safety or data validity. Socioeconomic status was not directly measured; however, the sample comprised students from public and private institutions with varied tuition costs and scholarship coverage, suggesting a heterogeneous socioeconomic background typical of the regional higher education context.

### 2.3. Nutritional Status

Body weight and height were measured using a digital scale (SECA, Hamburg, Germany; accuracy: 0.1 kg) and stadiometer (SECA®, Germany; accuracy: 0.1 cm), respectively. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared ( $\text{kg}/\text{m}^2$ ). Based on WHO guidelines, participants were classified into three categories: normal weight ( $\text{BMI} < 25 \text{ kg}/\text{m}^2$ ), overweight ( $\text{BMI} 25\text{--}29.9 \text{ kg}/\text{m}^2$ ), and obesity ( $\text{BMI} \geq 30 \text{ kg}/\text{m}^2$ ).

All anthropometric measurements were taken in the morning hours (between 8:00 a.m. and 11:00 a.m.) with participants in a fasted state, wearing light clothing and no shoes.

### 2.4. Physical Activity Level

The PAL activity was assessed using the International Physical Activity Questionnaire—Short Form (IPAQ-SF), a self-administered and validated instrument designed to measure physical activity across various populations [25]. This questionnaire has been widely used in epidemiological studies, particularly in adult populations across diverse cultural contexts [26–28]. It captures information on the frequency and duration of physical ac-

tivity performed during the last seven days in three intensity domains: vigorous activity (8.0 METs), moderate activity (4.0 METs), and walking (3.3 METs). The IPAQ-SF was administered in person by trained members of the research team. Participants completed the questionnaire in a controlled setting, where standardized instructions were provided to ensure proper understanding and minimize response bias.

For data processing, total physical activity was calculated in METs-minutes per week by multiplying the time spent per week in each activity domain—vigorous, moderate, and walking—by its corresponding MET value (8.0, 4.0, and 3.3 METs, respectively), and summing the results across all domains. According to the IPAQ-SF scoring protocol, participants were then categorized into two levels of PAL: physically inactive, defined as a total energy expenditure of less than 600 MET-min/week, and physically active, defined as an expenditure equal to or greater than 600 MET-min/week [25,26].

### 2.5. Dynamic Postural Balance

Dynamic postural balance was assessed using the SEBTm, a reliable and widely used test for evaluating dynamic postural control [16]. This version of the SEBT focuses on three reach directions: anterior, PM, and PL. The assessment was conducted using the Y Balance Test Kit™ (Functional Movement System, Chatham, VA, USA), adapted for the SEBTm protocol. Participants performed the test barefoot and wearing athletic clothing. The starting position required the participant to stand at the center of a Y-shaped grid with hands positioned on the iliac crests [16,29,30]. While maintaining balance on the test limb (stance limb), participants were instructed to reach as far as possible with the opposite leg in each of the three directions. Each participant completed three trials per direction, and the longest valid reach was recorded [16,29,30]. Before the SEBTm, participants completed a familiarization trial in each direction to minimize learning effects and ensure test reliability.

A trial was considered valid if the stance foot remained flat on the ground (without heel lift) and the participant returned to the starting position without losing balance. The test was administered for the dominant limb. The dominant lower limb was determined by asking participants which leg they would naturally use to kick a ball. Reach distances were normalized relative to lower limb length using the formula:  $(\text{Reach distance [cm]} / \text{Limb length [cm]}) \times 100\%$ . Limb length was measured from the anterior superior iliac spine to the medial malleolus [30,31]. A higher value in percentage represents a better dynamic postural balance.

The SEBTm has demonstrated good to excellent intra-rater reliability, with intraclass correlation coefficients (ICC) ranging from 0.830 to 0.891 depending on the direction assessed. The standard error of measurement (SEM) ranged from 3.46% to 5.11%, and the minimal detectable change (MDC) values ranged between 6.7% and 14.6%, supporting its use as a reliable tool for dynamic balance assessment [32].

### 2.6. Statistical Analysis

Data were analyzed using GraphPad Prism version 9.0 (GraphPad Software, La Jolla, CA, USA). Descriptive statistics, including mean and standard deviation, were calculated for all variables. The Shapiro–Wilk test was used to assess the normality of data distributions. To compare dynamic postural balance according to PAL (physically active vs. physically inactive), an independent samples t-test was applied. For comparisons based on nutritional status (normal weight, overweight, and obese), a one-way ANOVA was performed, followed by Tukey's post hoc test to identify specific group differences.

In addition, a multiple linear regression analysis was conducted to explore the relationship of nutritional status and PAL with dynamic postural balance (expressed as normalized reach distance). Two regression models were developed: Model 1 included nutritional

status and PAL as independent variables (unadjusted model), while Model 2 incorporated these variables adjusted for the sex variable. Prior to performing multiple linear regression analyses, all independent variables were tested for multicollinearity using variance inflation factor (VIF) and tolerance statistics. The initial set of predictors included nutritional status (BMI categories), PAL (IPAQ-SF categories), sex and age. However, age was excluded from the final models due to high collinearity with BMI ( $VIF > 10.0$  and tolerance  $< 0.10$ ), which could compromise model stability. The final regression models, therefore, included three predictors: nutritional status, PAL, and sex. These variables demonstrated acceptable collinearity diagnostics ( $VIF < 2.0$ ), ensuring robust model estimation. The significance level for all tests was  $p < 0.05$ .

### 3. Results

The total sample consisted of 189 young adults aged between 18 and 29 years. Descriptive characteristics by sex and nutritional status are presented in Table 1.

**Table 1.** Basal characteristics of the sample (mean and standard deviations).

| Sex    | <i>n</i> | Age (Years) | Weight (kg) | Height (cm) | BMI (kg/m <sup>2</sup> ) |
|--------|----------|-------------|-------------|-------------|--------------------------|
| Female | 81       | 22.8 ± 2.26 | 67.2 ± 13.9 | 159.8 ± 5.8 | 26.3 ± 4.6               |
| Male   | 108      | 23.3 ± 2.70 | 78.9 ± 12.1 | 173.7 ± 6.8 | 26.0 ± 3.5               |

BMI: body mass index. Data presented mean and standard deviation.

#### 3.1. Dynamic Postural Balance According to Nutritional Status

The results of dynamic postural balance according to nutritional status are presented in Table 2.

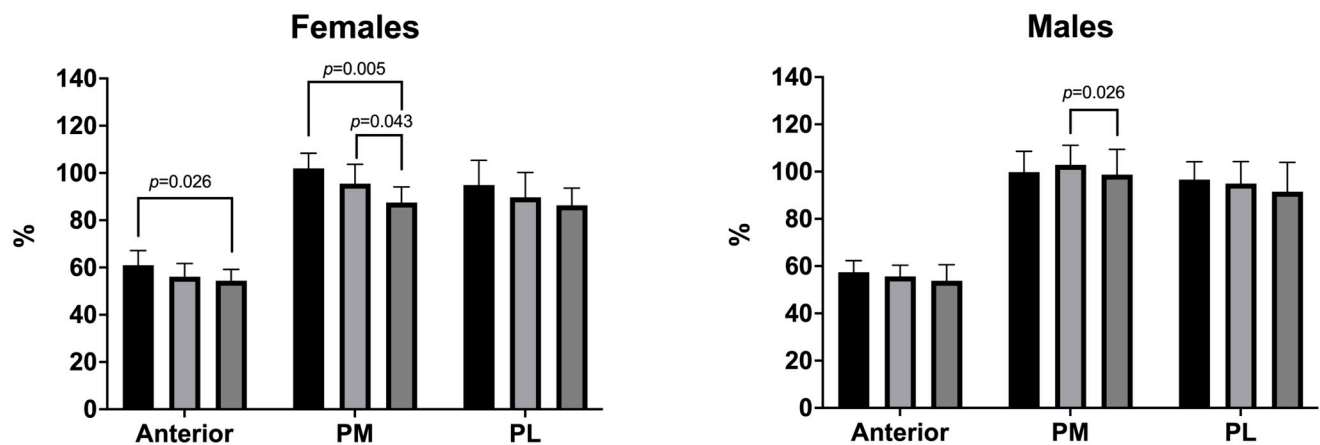
**Table 2.** Results of dynamic postural balance test according to nutritional status (mean and standard deviations).

| Group                              | Anterior (%) | PM (%)      | PL (%)      |
|------------------------------------|--------------|-------------|-------------|
| Normal weight (♀) ( <i>n</i> = 33) | 60.9 ± 6.2   | 101.9 ± 6.4 | 94.8 ± 10.5 |
| Overweight (♀) ( <i>n</i> = 37)    | 56.1 ± 5.6   | 95.5 ± 8.2  | 89.7 ± 10.5 |
| Obese (♀) ( <i>n</i> = 11)         | 54.4 ± 4.8   | 87.5 ± 6.6  | 86.3 ± 7.3  |
| <i>p</i> -value                    | 0.046 *      | 0.002 *     | 0.272       |
| Normal weight (♂) ( <i>n</i> = 48) | 57.4 ± 4.9   | 99.8 ± 8.8  | 96.6 ± 7.6  |
| Overweight (♂) ( <i>n</i> = 43)    | 55.6 ± 4.7   | 102.8 ± 8.3 | 94.9 ± 9.3  |
| Obese (♂) ( <i>n</i> = 17)         | 53.8 ± 6.8   | 98.7 ± 10.7 | 91.5 ± 12.4 |
| <i>p</i> -value                    | 0.065        | 0.036 *     | 0.544       |

♀: female; ♂: male. PM: posteromedial; PL: posterolateral. \*  $p < 0.05$  one-way ANOVA test.

In females, the ANOVA revealed statistically significant differences in dynamic postural balance across nutritional status groups in the PM ( $p = 0.002$ ) reach direction. Conversely, in the anterior ( $p = 0.046$ ) and PL direction ( $p = 0.272$ ), no significant differences were observed between nutritional status groups. The result of the post hoc tests is shown in Figure 1.

Post hoc analysis showed that in the anterior direction, females classified as obese exhibited significantly lower reach scores compared to those with normal weight ( $p = 0.026$ ). However, no significant differences were observed between females with overweight and those in the other two groups. In the PM direction, significant differences were again observed between normal-weight and obese females ( $p = 0.005$ ), with the obese group demonstrating shorter reach distances. Additionally, a significant difference was observed between overweight and obese females ( $p = 0.043$ ), whereas no significant differences were found between normal-weight and overweight participants.



**Figure 1.** Multiple comparisons of SEBTm reach directions by nutritional status in females and males. Each set of bars represents groups categorized by nutritional status: the black bar corresponds to participants with normal weight, the light gray bar represents those who are overweight, and the dark gray bar indicates participants with obesity.

In males, the ANOVA indicated significant differences in dynamic postural balance according to nutritional status in the PM direction ( $p = 0.036$ ). However, no significant differences were identified in the anterior ( $p = 0.065$ ) or PL ( $p = 0.544$ ) directions. The result of the post hoc tests is shown in Figure 1. Post hoc comparisons revealed that male with obesity demonstrated significantly reduced reach distances in the PM direction compared to those classified as overweight ( $p = 0.047$ ).

### 3.2. Dynamic Postural Balance According to Physical Activity Level

The results of dynamic postural balance according to PAL are presented in Table 3.

**Table 3.** Results of dynamic postural balance test according to PAL (mean and standard deviations).

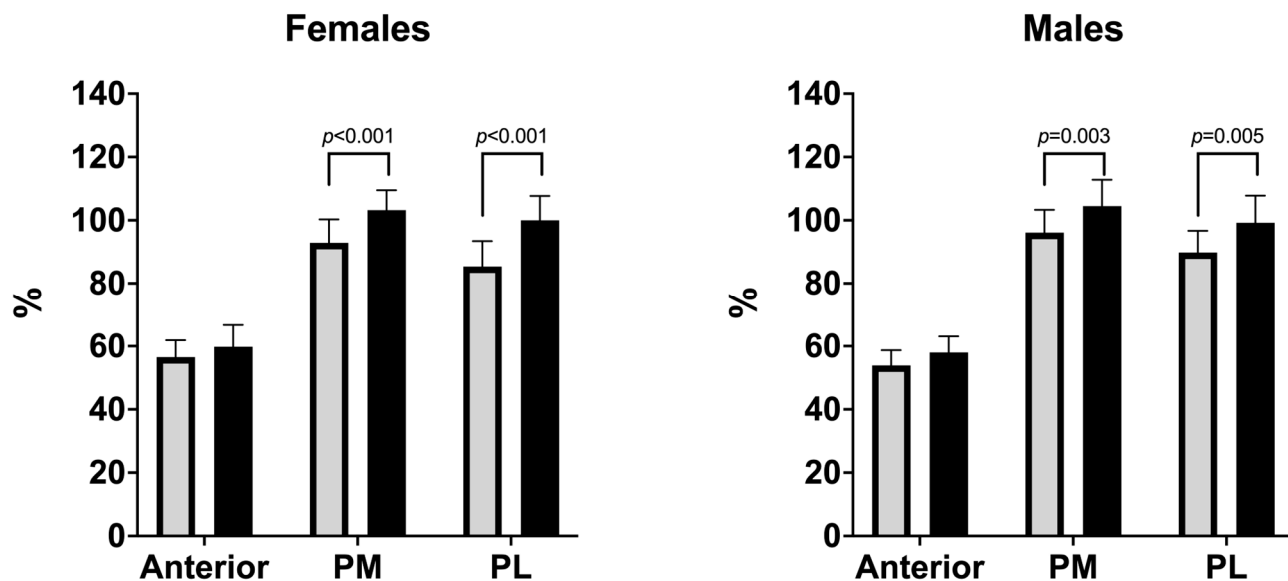
| Group                     | Anterior (%)   | PM (%)          | PL (%)          |
|---------------------------|----------------|-----------------|-----------------|
| Inactive (♀) ( $n = 52$ ) | $56.5 \pm 5.4$ | $92.9 \pm 7.4$  | $85.4 \pm 8.0$  |
| Active (♀) ( $n = 29$ )   | $59.8 \pm 6.9$ | $103.2 \pm 6.3$ | $100.0 \pm 7.7$ |
| <i>p</i> -value           | 0.101          | <0.001 *        | <0.001 *        |
| Inactive (♂) ( $n = 45$ ) | $53.9 \pm 4.8$ | $96.1 \pm 7.2$  | $89.8 \pm 6.9$  |
| Active (♂) ( $n = 63$ )   | $58.0 \pm 5.1$ | $104.5 \pm 8.3$ | $99.2 \pm 8.6$  |
| <i>p</i> -value           | 0.694          | 0.003 *         | 0.005 *         |

♀: female; ♂: male; PM: posteromedial; PL: posterolateral. \*  $p < 0.05$  T-Student test.

In females, the comparison between physically active and inactive participants revealed significant differences in dynamic postural balance. Specifically, physically active females demonstrated greater reach distances in PM ( $p = 0.0004$ ) and PL ( $p = 0.0002$ ) directions (Figure 2). No statistically significant difference was observed in the anterior direction ( $p = 0.101$ ).

In males, the comparison between physically active and inactive participants revealed statistically significant differences in two of the three reach directions. Physically active males demonstrated greater reach distances in PM ( $p = 0.003$ ) and PL ( $p = 0.005$ ) directions (Figure 2). In contrast, no significant difference was observed in the anterior direction ( $p = 0.694$ ).





**Figure 2.** Multiple comparisons of SEBTm reach directions by PAL in females and males. Each set of bars represents groups categorized by PAL: the black bar corresponds to physically active participants, while the light gray bar represents those who are physically inactive.

### 3.3. Linear Regression Analysis for Dynamic Postural Balance

For the anterior direction, the unadjusted model ( $R^2 = 0.028$ ) showed no significant associations between dynamic postural balance and either PAL ( $\beta = 0.548$ ;  $p = 0.616$ ) or nutritional status ( $\beta = 1.824$ ;  $p = 0.063$ ). After adjusting for sex, the model ( $R^2 = 0.051$ ) confirmed that these associations remained non-significant for PAL ( $\beta = 0.965$ ;  $p = 0.385$ ) and nutritional status ( $\beta = -1.831$ ;  $p = 0.096$ ), with sex also failing to reach statistical significance ( $\beta = 1.567$ ;  $p = 0.126$ ).

In contrast, the PM direction yielded significant associations. The unadjusted model ( $R^2 = 0.099$ ) revealed that individuals with normal weight ( $B = 2.900$ ;  $p = 0.001$ ) and those who were physically active ( $B = 3.622$ ;  $p = 0.040$ ) had significantly better dynamic balance. The adjusted model (by sex) ( $R^2 = 0.289$ ) confirmed these findings, with both nutritional status ( $B = 2.784$ ;  $p = 0.015$ ) and PAL ( $B = 2.962$ ;  $p = 0.011$ ) remaining significant predictors. Additionally, sex emerged as a significant factor ( $B = 8.248$ ;  $p < 0.001$ ), with males demonstrating superior dynamic postural balance performance.

Similarly, for the PL direction, the unadjusted model ( $R^2 = 0.121$ ) showed that having a normal weight ( $B = 3.245$ ;  $p < 0.001$ ) and being physically active ( $B = 4.792$ ;  $p = 0.012$ ) were both significantly associated with greater reach distances. In the adjusted model (by sex) ( $R^2 = 0.275$ ), these associations remained significant—normal weight ( $B = 2.413$ ;  $p = 0.004$ ), PAL ( $B = 4.203$ ;  $p = 0.031$ ), and male sex ( $B = 7.712$ ;  $p < 0.001$ ).

## 4. Discussion

The results of this study reveal that nutritional status, PAL, and sex are significant predictors of dynamic postural balance performance in young adults. Specifically, for the PM and PL directions of the SEBTm, individuals with excess weight, low PAL, and female sex exhibited lower reach distances, reflecting poorer postural control. These findings are consistent with previous studies that have individually identified associations between overweight/obesity and reduced balance [13,19,33], as well as between low PAL and impaired postural stability [13] in both children and adults. However, the strength of this study lies in its integrative approach—considering multiple factors simultaneously—demonstrating that the combination of nutritional and behavioral variables more accu-

rately predicts dynamic balance performance than any single factor alone. Despite the growing body of evidence on the impact of excess weight on balance, few studies have examined this relationship using adjusted regression models in young adult populations, particularly including physical activity as a co-variable.

One of the main factors affecting dynamic postural balance in this study was nutritional status. Excess weight may negatively affect dynamic postural balance due to the biomechanical and neuromuscular challenges associated with greater body mass. Obesity is known to alter the center of mass and impair proprioceptive feedback, which are both crucial for maintaining balance during unilateral tasks. The accumulation of adipose tissue may also hinder joint mobility and delay neuromuscular responses [34], especially in complex movements such as the PL or PM reach directions. Our findings reinforce the notion that individuals with excess weight exhibit lower functional reach capacities, particularly when postural control demands are higher.

In parallel, physical activity emerged as another significant predictor of balance performance. Its relationship may be explained by a range of physiological adaptations, including improved muscle strength, neuromotor coordination, and proprioceptive sensitivity [35,36]. The significant differences observed between physically active and inactive participants—especially in the PL and PM directions—may be explained by the regular neuromuscular stimulation that physical activity provides [37]. Physically active individuals often present better functional stability, quicker response to perturbations, and greater lower-limb control during balance tasks [38]. These results support current public health recommendations that promote physical activity as a preventive strategy against balance deficits.

Sex also played a relevant role in dynamic postural balance. The adjusted regression models also revealed that male participants achieved greater reach distances than females in dynamic balance tasks. Previous studies have reported conflicting results; however, the prevailing trend suggests that females tend to exhibit better postural balance than males in both static [39] and dynamic [40,41] tests. Nevertheless, these studies have not conducted analyses adjusted for nutritional status and PAL, as was performed in the present research. In our study, males demonstrated better dynamic postural balance than females, which may be attributed to the fact that males typically possess greater muscle mass, higher lower-limb muscle strength, and more frequent engagement in sports and physical exercise compared to females of the same age group [42,43]. These physiological and behavioral differences likely contribute to the superior performance observed in dynamic postural balance among males, highlighting the importance of sex as a factor to consider in balance assessments and interventions.

Unlike the PM and PL directions, the anterior reach did not show significant associations with either nutritional status or PAL. This may be explained by the biomechanical simplicity and strong visual guidance inherent in this movement [44]. Since participants are able to clearly see the direction and endpoint of the anterior reach, visual feedback may compensate for physical or neuromuscular limitations [45]. Additionally, this direction may require less range of motion and neuromuscular control, making it less sensitive for detecting balance impairments in young adults [44].

This study presents several limitations that should be acknowledged. First, its cross-sectional design prevents establishing causal relationships between nutritional status, physical activity level, and postural balance. Second, physical activity was assessed using a self-reported questionnaire (IPAQ-SF), which, despite being widely used and validated, may be subject to recall bias and over- or underestimation. The absence of objective measures, such as accelerometry, limits the precision of physical activity quantification. Third, although testing was conducted under standardized conditions, participant motivation during the dynamic balance assessment may have influenced performance, introducing



a potential source of bias. Additionally, the evaluation was performed exclusively on the dominant lower limb, without analyzing potential asymmetries. Lastly, the lack of longitudinal follow-up restricts our understanding of how changes in weight or activity levels may influence postural control over time.

Despite these limitations, the findings of this study have practical implications for health professionals, educators, trainers and sports scientists. Interventions aimed at improving dynamic postural balance in young adults should consider both nutritional status and physical activity habits. Regular physical activity programs, particularly those targeting balance, coordination, and lower-limb muscle strength, may be especially beneficial for individuals with excess weight. Furthermore, incorporating dynamic balance assessments such as the SEBTm into preventive screening protocols may aid in the early identification of individuals at higher risk of instability, enabling timely and personalized intervention strategies. These assessments can be applied not only in clinical contexts, but also in educational and sports settings, where they may support targeted actions to enhance physical function and prevent injuries.

## 5. Conclusions

This study determined that excess weight and low PAL are significant predictors of poor dynamic postural balance in young adults. Specifically, individuals classified as overweight or obese and those with insufficient physical activity exhibited reduced reach distances in the PM and PL directions of the SEBTm. Additionally, male sex emerged as a favorable factor, with men demonstrating better dynamic balance performance than females. These results emphasize the importance of considering both nutritional and behavioral factors when assessing postural stability. Therefore, interventions for young adults with excess weight should not only focus on weight reduction but also prioritize regular physical activity to improve motor function and dynamic stability compromised by the effects of overweight and physical inactivity.

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**Conflicts of Interest:** The authors declare that there are no conflicts of interest.

## Abbreviations

The following abbreviations are used in this manuscript:

|         |                                                          |
|---------|----------------------------------------------------------|
| SEBTm   | Modified Star Excursion Balance Test                     |
| PL      | Posterolateral                                           |
| PM      | Posteromedial                                            |
| PAL     | Physical Activity Level                                  |
| BMI     | Body Mass Index                                          |
| IPAQ-SF | International Physical Activity Questionnaire—Short Form |
| METs    | Metabolic Equivalent of Task                             |

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