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Relationships of muscle quality and anthropometry with social determinants of health in noninstitutionalized elderly people

Relações entre a qualidade muscular e a antropometria com os determinantes sociais de saúde em idosos não institucionalizados

Relaciones entre la calidad muscular y la antropometría con los determinantes sociales de la salud en personas mayores no institucionalizadas

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Abstract
Social Determinants of Health (SDHs) have a substantial influence on the health status of the elderly population. During aging, there may be a reduction in muscle quality, which is directly related to loss of functionality and autonomy. The identification of aspects that associate poor muscle quality with SDHs in aging is reflected in possible personalized interventions to reduce this prevalence. This study aimed evaluate the relationships of muscle quality and anthropometric parameters with SDHs in elderly residents of a city in southern Minas Gerais. The sociodemographic and health conditions, income, education level, marital status, physical activity level, anthropometric measurements, bioelectrical impedance analysis (BIA), and hand grip strength were evaluated across 2 days to calculate the muscle quality index (MQI). Most of the study participants were women (82.6%), individuals aged 60 to 69 years (54.2%). Lower muscle quality was found in older elderly individuals ($p=0.029$), those who were less physically active ($p=0.013$), and those with lower education levels ($p=0.037$). The MQI was negatively correlated with age in years ($\rho=-0.200$, $p=0.016$) and Body Mass Index (BMI) ($\rho=-0.182$, $p=0.029$) and positively correlated with education level ($\rho=0.172$, $p=0.049$). The SDHs that showed the greatest association with muscle quality were age, physical activity level, education level, and BMI.
Keywords: Social Determinants of Health; Muscle Strength; Muscle Strength Dynamometer; Aged; Health of the Elderly.

Resumo
Os Determinantes Sociais da Saúde (DSS's) têm uma influência substancial sobre o estado de saúde da população idosa. Durante o envelhecimento, pode haver uma redução na qualidade muscular, que está diretamente relacionada à perda de funcionalidade e autonomia. A identificação de aspectos que associam a baixa qualidade muscular com os DSS's no envelhecimento reflete em possíveis intervenções personalizadas para reduzir essa prevalência. Este estudo

teve como objetivo avaliar as relações da qualidade muscular e dos parâmetros antropométricos com os DSS's em idosos residentes em uma cidade do Sul de Minas Gerais. As condições sociodemográficas e de saúde, renda, nível de escolaridade, estado civil, nível de atividade física, medidas antropométricas, análise de bioimpedância elétrica (BIA) e força de preensão manual foram avaliadas em dois dias para calcular o Índice de Qualidade Muscular (IQM). A maioria dos participantes do estudo eram mulheres (82,6%) e indivíduos com idades entre 60 e 69 anos (54,2%). A menor qualidade muscular foi encontrada em indivíduos mais idosos (p=0,029), naqueles que eram menos fisicamente ativos (p=0,013) e naqueles com níveis de escolaridade mais baixos (p=0,037). O IQM foi negativamente correlacionado com a idade em anos (ρ=-0,200, p=0,016) e com o Índice de Massa Corporal (IMC) (ρ=-0,182, p=0,029) e positivamente correlacionado com o nível de escolaridade (ρ=0,172, p=0,049). Os DSS's que mostraram maior associação com a qualidade muscular foram idade, nível de atividade física, nível de escolaridade e IMC.
Palavras-chave: Determinantes Sociais da Saúde; Força Muscular; Dinamômetro de Força Muscular; Idoso; Saúde do Idoso.

Resumen
Los Determinantes Sociales de la Salud (DSS) ejercen una influencia sustancial sobre el estado de salud de la población de personas mayores. Durante el envejecimiento, puede producirse una reducción en la calidad muscular, la cual está directamente relacionada con la pérdida de funcionalidad y autonomía. La identificación de aspectos que asocian la baja calidad muscular con los DSS en el envejecimiento refleja posibles intervenciones personalizadas para reducir esta prevalencia. El objetivo de este estudio fue evaluar las relaciones entre la calidad muscular y los parámetros antropométricos con los DSS en personas mayores residentes en una ciudad del sur de Minas Gerais. Las condiciones sociodemográficas y de salud, ingreso, nivel educativo, estado civil, nivel de actividad física, medidas antropométricas, análisis de bioimpedancia eléctrica (BIA) y fuerza de prensión manual fueron evaluados en dos días para calcular el Índice de Calidad Muscular (ICM). La mayoría de los participantes del estudio eran mujeres (82,6%) y personas con edades entre 60 y 69 años (54,2%). La menor calidad muscular se observó en personas de mayor edad (p=0,029), en aquellas menos físicamente activas (p=0,013) y en quienes presentaban niveles educativos más bajos (p=0,037). El ICM se correlacionó negativamente con la edad en años (ρ=-0,200, p=0,016) y con el Índice de Masa Corporal (IMC) (ρ=-0,182, p=0,029), y positivamente con el nivel educativo (ρ=0,172, p=0,049). Los DSS que mostraron una mayor asociación con la calidad muscular fueron la edad, el nivel de actividad física, el nivel educativo y el IMC.
Palabras clave: Determinantes Sociales de la Salud; Fuerza Muscular; Dinamómetro de Fuerza Muscular; Anciano; Salud del Anciano.

1. Introduction

Social Determinants of Health (SDHs), i.e., economic level, education, place of residence, profession, community networks, lifestyle, and health status, among others, account for 75% of the factors that influence the health of an individual (Northwood et al., 2018). SDHs have played a crucial role in understanding health disparities and are highly relevant instruments in the development of public policies with a primary focus on health inequalities (Llorens-Ortega et al., 2024).

SDHs influence the experience and physiological processes associated with aging. Chronic isolation and stress throughout an individual's life can accelerate the aging process or contribute to the development of age-related diseases that manifest in early adulthood (Chary et al., 2023). On that basis, muscle mass and strength are high during the youth and adulthood phases, are maintained throughout the middle age phase, and then decrease with aging. This decrease is associated with impaired muscle quality in the elderly (Baumgartner et al., 1998; Cruz-Jentoft et al., 2019).

Muscle quality is a broad concept that encompasses characteristics of skeletal muscle beyond muscle mass, including histological features, imaging-based properties, metabolic attributes, and functional or impairment related assessments (Cawthon et al., 2022). In this context, declines in muscle quality represent a key mechanism underlying the age-related reduction in exercise capacity, which arises from physical inactivity, functional, metabolic, and structural alterations in skeletal muscle and neuromotor control, as well as disease related impairments driven by the catabolic effects of chronic systemic conditions such as heart failure, chronic obstructive pulmonary disease, and cancer (Tieland et al., 2018). Therefore, identifying individuals with low muscle quality is important for preventing disabilities associated with aging (Cruz-Jentoft & Landi, 2014).

The identification of SDHs that influence muscle quality in the elderly may facilitate personalized interventions that can be performed in the future, stimulating functional independence and factors related to the preservation of muscle quality (Henly et al., 2011; WHO, 2019). The combination of the aging process and SDHs can lead to negative results, such as premature mortality, comorbidities, social isolation, and suffering (Tyrovolas et al., 2016). However, the intervention of a multidisciplinary team with experience in the biological, clinical, and social aspects of aging can develop public health strategies to prevent the onset of diseases caused by old age (Shea et al., 2024).

Given that the relationship of these determinants in individuals older than 60 years and the possible implications on muscle quality have not yet been elucidated, the objective of this study was to evaluate the relationship of muscle quality and anthropometric parameters with SDHs in elderly residents of a city in South Minas Gerais.

2. Methodology

Study design

This was a quantitative study with a cross-sectional and observational design (Pereira et al., 2018) using simple descriptive statistics with data classes, mean values and standard deviations, absolute frequency and percentage relative frequency values (Shitsuka et al., 2014) and statistical analysis (Vieira, 2021; Bekman & Costa Neto, 2009). The project was approved by the Human Research Ethics Committee of the Federal University of Lavras (opinion no. 3.049.720).

Convenience sampling was employed, and the collection sites were health clinics, senior retirement homes, family health strategy, social assistance reference centers, and religious institutions located in the city of Lavras-MG. Information regarding the study and participant recruitment was disseminated through the display of posters at the sites in question and through direct contact with individuals who frequented these places.

After elucidating the purpose of the study and the possible risks, benefits, and awareness of rights as a research participant, individuals were enrolled based on their agreement to participate by signing an informed consent form (ICF).

The inclusion criteria were noninstitutionalized elderly individuals of both sexes from the city of Lavras-MG, aged 60 years or older. The exclusion criteria were as follows: nonresponsive individuals; wheelchair users; bedridden individuals; who had undergone prosthetic limb replacement surgery and/or implantation of cardiac stents; who did not attend the established collection site; and individuals who did not sign the ICF.

Evaluations, tests, and application of the questionnaire were conducted by interviewers who had undergone training to ensure uniformity in data collection techniques.

Study Procedures

a) Evaluation of SDHs

Initially, anamnesis was applied, during which the name, telephone number, address, and identification number of the participant were recorded, in addition to their perception of weight change.

To evaluate SDHs, a form was applied that contained questions related to the social and demographic status of individuals, for example, age, sex, education level (without education, complete primary education, complete elementary school, complete high school, complete undergraduate, or complete graduate), marital status (single, divorced, married, or widowed), family income (1-2 minimum wages, 3 minimum wages, 4 or more minimum wages), support network (live alone or with others), number of morbidities (Polymorbidity when greater than or equal to 5 morbidities), regular daily use of drugs (Polypharmacy when greater than or equal to 5 different drugs), consumption of alcoholic beverages (yes or no), and consumption of cigarettes (yes or no). Questions were removed from the modified questionnaire based on the standard questionnaire of the Genetics of Healthy Aging - GEHA group (Franceschi et al., 2007).

Physical activity level was measured using the International Physical Activity Questionnaire (IPAQ), which estimates the weekly energy expenditure during physical activity (PA). This questionnaire considers the frequency of days (normal/usual week) and duration (hours and minutes per day and week) of physical activity in different IPAQ domains (commuting, housework, leisure, and sitting time). The sample was divided into 2 PA levels recommended for the elderly by the WHO: low - less active (<150 min/week) and normal - more active (≥150 min/week) (Benedetti et al., 2007; WHO, 2020).

SDHs were organized into distal (family income and education), intermediate (support network, marital status, polypharmacy, regular use of medications, alcohol consumption, and smoking), and proximal (sex, age, and polymorbidities) determinants (Dahlgren & Whitehead, 1991).

b) Anthropometry and muscle quality

The anthropometric measurements evaluated were weight and height, and then BMI [weight (kg)/height² (m)] was calculated.

Muscle quality was evaluated using the muscle quality index (MQI), which is based on the ratio between handgrip strength and estimated skeletal muscle mass (HGS/SMM) (SBNPE, 2019; Toledo et al., 2018).

The evaluation of SMM was estimated using bioelectrical impedance (BIA) (Model 450, Biodynamics®, WA, USA), where the resistance value (ohms) was obtained. Patient preparation was performed following the manufacturer's protocol, i.e., water ingestion of 1.5 L to 2 L in the day; no physical exercise for 24 hours; no caffeinated foods and alcoholic beverages for 12 hours; and fasting for 4 hours before the procedure. If any individual reported failure in any of the test preparatory items, the procedure was rescheduled.

After obtaining the resistance value (ohms) by BIA, SMM was calculated using the equation proposed by Janssen et al. (2004): SMM (kg) = [(height2/resistance×0.401) + (0×3.825) + (age (years) × -0.071)] + 5.102. The SMM was adjusted for body size using the squared height: SMI=(SMM/height2) (Kim et al., 2016).

A Jamar® Hydraulic Hand dynamometer was used to assess hand grip strength. The subject was seated with the shoulder adducted in a neutral position, elbow flexed at 90°, and forearm in semi-pronation. During the handgrip assessment, the arm remained immobile, allowing only flexion of the interphalangeal and metacarpophalangeal joints. This test was performed 3 times; the highest value was considered among the measurements (Russell, 2015).

Statistical Analysis

The database was completed by 2 team members independently and checked by a third member. Frequency analyses of descriptive statistics were performed to characterize the data.

The Shapiro-Wilk normality test was performed. Paired t-tests (MQI, sex, alcohol consumption, smoking status, physical activity level, support network, polymorbidities, regular use of medications, and polypharmacy) and one-way ANOVA (MQI, age, marital status, education, and family income) with Duncan's post hoc test were used to compare means. Pearson's bivariate correlation was used to assess the relationship between the variables (age, education level, morbidities, and medication use) and the MQI; the strength of the correlation was classified as follows: r±0.1, small effect; r±0.3, medium effect; and r±0.5, large effect (Field, 2020). Statistical analyses were performed using SPSS version 22.0.

The significance level adopted for all statistical tests was 5% ($p<0.05$).

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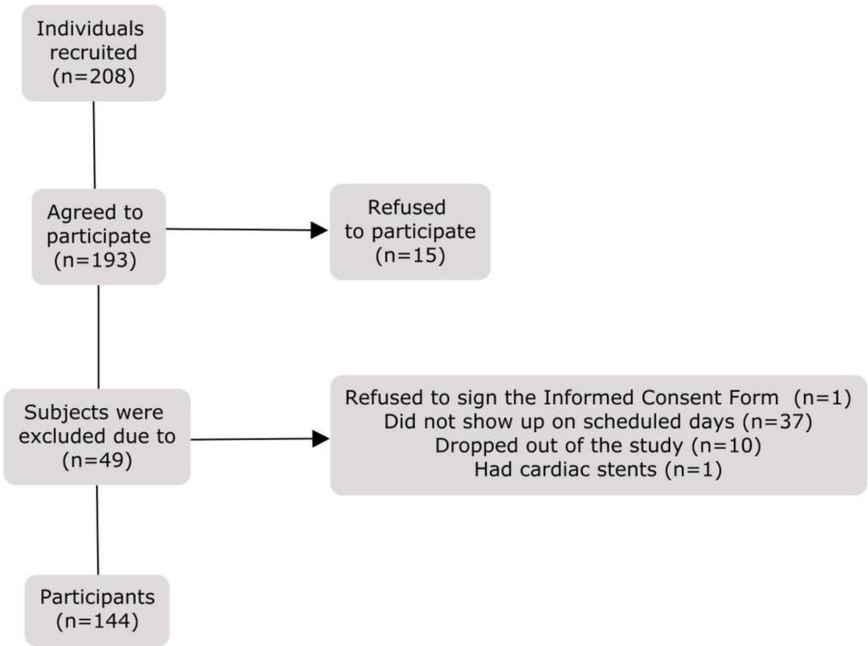
3. Results

Initially, 208 individuals were recruited for the study, but 15 refused to participate. Among the individuals who agreed to participate (n=193), 49 were excluded from the study for various reasons; the final sample size was 144 participants, as shown in Figure 1.

Figure 1 - Study flow chart



Source: Research data (2025).

Most of the study participants were women (82.6%, n=119) and individuals aged 60 to 69 years, accounting for 54.2% of the sample (n=78), married (57.6%, n = 83) and living with a partner (spouse, children, and/or siblings) (84%, n=121), as shown in Table 1.

Most individuals had no education or had only completed primary education (57.6%, n=83), and an average family income of 1 to 2 minimum wages was predominant (47.2%, n=68). Regarding health status, approximately 19.4% of the participants reported polymorbidities (n=28), and 18.7% reported polypharmacy (n=27). The regular daily use of medications was reported by 94.4% of the participants (n=136). More than 70% (n=109) of the participants had a normal level of physical activity (PA), 24.3% (n=35) had a low level of PA; 56.3% did not consume any alcoholic beverage, and 65.3% were not smokers (in the past and currently) (Table 1).

Table 1 - Characterization of the sample population.

Variables	Total (n)	Total (%)	Male (n)	Male (%)	Women (n)	Women (%)
Sex						
Women	119	82.6				
Men	25	17.4				
Age						
60 to 69 years	78	54.2	12	48	66	55.5
70 to 79 years	55	38.2	12	48	43	36.1
≥80 years	11	7.6	1	4	10	8.4

Polymorbidity (≥5 morbidities)						
No	116	80.6	25	100	91	76.5
Yes	28	19.4	0	0	28	23.5
Marital status						
Single	13	9	1	4	12	10.1
Married	83	57.6	18	72	65	54.6
Divorced	16	11.1	4	16	12	10.1
Widowed	32	22	2	8	30	25.2
Support network						
Lives alone	23	16	2	8	21	17.6
Lives with others	121	84	23	92	98	82.4
Consumption of alcoholic beverages						
No	81	56.3	10	40	71	59.7
Yes	63	43.8	15	60	48	40.3
Smoker (current or past)						
No	94	65.3	6	24	88	73.9
Yes	50	34.7	19	76	31	26.1
Level of PA						
Normal	109	75.7	18	72	91	76.5
Low	35	24.3	7	28	28	23.5
Regular use of medications						
No	8	5.6	4	16	4	3.4
Yes	136	94.4	21	84	115	96.6
Polypharmacy (≥5 drugs/day)						
No	117	81.3	23	92	94	79
Yes	27	18.7	2	8	25	21
Education level						
No education or complete primary education	83	57.6	13	52	70	58.8
Complete elementary school or high school education	42	29.2	7	28	35	29.4
Complete higher education or complete graduate education	19	13.2	5	20	14	11.8
Family income						
1-2 MW	89	61.8	9	36	80	67.2
3 MW	22	15.3	5	20	17	14.3
≥4 MW	29	20.1	10	40	19	16.0

MW - minimum wage; PA - physical activity. Source: Research data (2025).

The mean BMI across all subjects was 27.3 ± 4.1 kg/m² (mild overweight). Among the men, the mean BMI was 26.9 ± 4.1 kg/m², while among the women, it was 27.3 ± 4.2 kg/m². Concerning the muscle assessment data, the mean quadriceps strength index (MQI) (handgrip strength/skeletal muscle mass) was 1.50±0.36 kg/kg. Among the male participants, the MQI was 1.59±0.37 kg/kg, while among the female participants, it was 1.49±0.35 kg/kg.

The MQI of the younger elderly was higher than the MQI of the older elderly (p=0.029), and the MQI of the most physically active individuals was higher than the MQI of the least active individuals (p=0.013). There was a significant difference between groups for education level; the “No education or complete primary education” group had a lower MQI than the “Higher education or complete graduate” group (p=0.037), as shown in Table 2. There were no significant differences between muscle quality and the other SDH categories evaluated.

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Table 2 - Relationship between social determinants of health and MQI.

Variables	Mean±SD of the MQI	P-value
Proximal social determinants of health		
Sex		0.174
Women	1.49±0.35 (n=119)	
Men	1.59±0.37 (n=25)	
Age		0.029*
60 to 69 years	1.57±0.38* (n=78)	
70 to 79 years	1.46±0.32 (n=55)	
≥80 years	1.30±0.30* (n=11)	
Polymorbidities (≥5 morbidities)		0.693
No	1.51±0.35 (n=116)	
Yes	1.48±0.40 (n=28)	
Intermediate social determinants of health		
Marital status		0.278
Single	1.42±0.33 (n=13)	
Divorced	1.66±0.43 (n=16)	
Married	1.49±0.36 (n=83)	
Widowed	1.49±0.31 (n=32)	
Support network		0.772
Lives with others	1.50±0.36 (n=121)	
Lives alone	1.53±0.36 (n=23)	
Alcohol consumption		0.644
No	1.49±0.34 (n=81)	
Yes	1.52±0.38 (n=63)	
Smoker (current or past)		0.158
No	1.51±0.34 (n=94)	
Yes	1.50±0.40 (n=50)	
Level of PA		0.013*
Normal	1.55±0.35 (n=108) *	
Low	1.38+0.36 (n=33) *	
Regular use of medications		0.624
No	1.57±0.20 (n=8)	
Yes	1.50±0.37 (n=136)	
Polypharmacy (≥5 drugs/day)		
No	1.51±0.34 (n=117)	0.537
Yes	1.47±0.41 (n= 27)	
Distal social determinants of health		
Level of education		0.037*
No education or complete primary education	1.48±0.37* (n=83)	
Complete elementary school or high school education	1.49±0.31 (n=42)	
Higher education or complete graduate education	1.67±0.38* (n=19)	
Monthly family income		0.706
1-2 MW	1.49±0.36 (n=89)	
3 MW	1.52±0.34 (n=22)	
≥4 MW	1.52±0.38 (n=29)	
Did not answer	1.70±0.29 (n=4)	

SD - standard deviation of the mean; MW - minimum wage; PA - physical activity. Statistical significance was set at p<0.05*; paired t-test. One-way ANOVA; Duncan's post hoc test. Source: Research data (2025).

There was a negative correlation between age in years and MQI (ρ=-0,200, p=0.016, small effect) and between BMI and MQI (ρ=-0.182, p=0.029, small effect). There was a positive correlation between education level and MQI (ρ=0.172, p=0.049, small effect), as shown in Table 3.

Table 3 - Correlation between the MQI and SDHs.

Variables	Mean±SD	Correlation coefficient	*P -value*
Age (years)	69.6±6.4	-0.200*	0.016*
No. of morbidities	3.0±1.7	-0.045	0.590
No. of medications	3.1±1.8	-0.082	0.346
Education level (years)	6.9±4.5	0.172*	0.049*
BMI (kg/m^2)	27.3±4.1	-0.182*	0.029*

SD - standard deviation of the mean; MQI - muscle quality index; BMI - body mass index. *p<0.05 by Pearson correlation. Source: Research data (2025).

4. Discussion

In this study, the relationship between SDHs and the elderly and their implications on muscle quality is still unprecedented in the literature. However, our main results demonstrated that the SDHs showing the strongest association with muscle quality were age, level of education and physical activity, and body mass index.

According to the IBGE (IBGE 2020), of the total 210.1 million Brazilians, approximately 34 million were elderly, accounting for 16.2% of the country's population. Data from the Continuous National Household Sample Survey (PNADC-2018) indicate that the number of women in Brazil is higher than that of men (48.2% men and 51.8% women) and that most individuals aged 60 years or older live with other people in the household (83.2%) (IBGE 2018). In the present study, the majority of the elderly sample population consisted of women aged 60-69 years who were married and living with someone. These data are corroborated by The Brazilian Longitudinal Study of Aging (ELSI-Brazil), which indicated a prevalence of women, with a mean age of 62.9 years and 3 people in the same household (Lima-Costa et al., 2018).

Regarding education level, most of the individuals in this study had no education or had only completed primary education, a finding that agrees with the results of a study conducted by the Getúlio Vargas Foundation in 2018 in which older people had 3.3 years of education less than the average years of education for the population and only 5.8% had 11 years or more of education, with the rate being slightly higher (10%) for a complete higher education (FGV 2020). This indicates, therefore, that despite the convenience sampling, the participants in the present study represent, at least in part, the elderly Brazilian population.

SDHs include the economic and social conditions that influence individual and group differences in health status and include factors such as socioeconomic status, education level, marital status, lifestyle, etc. As such, these determinants have a profound influence on health-related behaviors and health outcomes. There is evidence that social disadvantage leads to increased susceptibility to many chronic diseases, musculoskeletal system impairments, and less acceptance of preventive care (Chen et al., 2014; Sullivan et al., 2017). Thus, the present study aimed to identify which SDHs could be related to the muscle quality of elderly individuals.

Muscle quality is often described using two different domains: the functional domain refers to the equivalent muscle function per unit of muscle mass, and the morphological domain refers to the architecture or micro- or macroscopic composition of the muscle mass (Alves et al., 2023). The quality of muscle tissue is the result of a complex interaction between multiple specific factors, including fiber type, fat infiltration, and the extracellular matrix. In addition, neural factors play a role in this process (Barbat-Artigas et al., 2013). Although the importance of assessing muscle quality has been recognized, there is still no consensus on its evaluation in clinical practice. Based on its formal definition (relationship between strength or power produced per unit of muscle mass), certain methods have been used to measure muscle quality, for example, the MQI, but there are no cutoff values validated for the elderly population (Barbat-Artigas et al., 2012; Toledo et al., 2018).

In this study, the MQI values for men and women were similar, that contradicts those of other studies that show that women may have lower muscle quality than men (Dodds et al., 2014; Fragala et al., 2012). Unlike the proposal of the present study, the study conducted by de Sousa Neto et al. (2023) started from the premise of investigating the association of different MQI indices with timed-up-and-go (TUG) performance (a validated instrument for assessing physical capacity during the aging process), aerobic capacity, and obesity indices in obese elderly women. As the main result of the study, the field MQI demonstrated effectiveness regarding TUG performance in obese elderly women (de Sousa Neto et al., 2023).

Regarding age and aging, the results of the present study confirm that age negatively affects muscle quality. The neuromuscular system exhibits an impressive ability to adapt to both form and function. Among the factors that significantly influence these adaptations are aging and changes in physical activity (Deschenes et al., 2018). Various aspects of the aging process have been implicated in lipotoxicity and the function of skeletal muscle contractility, making type II muscle fibers particularly susceptible as age progresses (Carter et al., 2019). Selective atrophy of type II muscle fibers contributes to reduced strength and power in older adults compared with younger individuals. Preserving or enhancing the size of these fibers is crucial for maintaining muscle function in the elderly and improving their quality of life. A deeper understanding of the mechanisms underlying type II fiber hypertrophy could pave the way for targeted interventions to counter age-related functional decline (Moro et al., 2020).

Among the intermediate SDHs, only PA was identified as related to muscle quality because the less physically active individuals had lower muscle quality than did the more physically active individuals. Sarcopenia affects the skeletal muscle system and is characterized by pronounced deficits in muscle strength, muscle mass, muscle quality, and metabolic health during aging (Paez et al., 2023). It is associated with a high risk of developing adverse health outcomes, including low survival rates, postoperative complications, and increased hospitalization time after falls and fractures (Yuan & Larsson, 2023). In the present study, although not presenting a sarcopenic population, it was found that there is a relationship between the reduction in MQI with the level of physical activity and aging, which may contribute to the development of sarcopenia.

In the present study, formal educational instruction, a distal SDH, was shown to influence muscle quality because the group of elderly individuals with no education or who had only completed initial education exhibited lower muscle quality than the more educated groups. This may be related to the differences in education and wealth established early in life, as they are strongly associated with disparities in healthy aging; however, we found no differences between the current income of elderly individuals and muscle quality (Wu et al., 2020). Education is also strongly associated with life expectancy, morbidity, and behaviors, and formal educational achievement plays an important role in health, creating opportunities, employment, and income (Parker et al., 2020).

This study showed no influence between the number of morbidities or medications used and muscle quality. However, these associations may have been influenced because the studied sample had a high prevalence of young elderly individuals with normal physical activity practice, and nearly all elderly individuals did not have multiple comorbidities or use more than five medications per day. Matsumoto et al. (2022) demonstrated a negative association between polypharmacy and muscle strength in older patients undergoing convalescent rehabilitation after stroke. However, there is little evidence to describe these associations with muscle mass, strength, and quality separately. On the other hand, in a study conducted with institutionalized elderly individuals, resistance training was effective in those who were more rail and were taking a higher number of medications in terms of increasing muscle mass and improving muscle quality (Strasser et al., 2018). Despite the significant interindividual variations in the effects of physical activity on health, the literature confirms its effectiveness for a large portion of individuals with non-communicable chronic diseases (Sylow & Richter, 2019). In this context, chronic diseases, particularly when present as multimorbidity, have been consistently associated with reductions in muscle mass and strength (Santa Helena et al., 2025; Veronese et al., 2021). Although associations between certain comorbidities and the musculoskeletal system have been shown in the literature, this relationship can be mediated by many factors, such as a lower level of physical activity and a higher number of inflammatory markers (Kalyani et al., 2014).

Aging is characterized by unfavorable changes in body composition, notably increased fat mass and reduced lean mass. These alterations are associated with declines in muscle strength, greater abdominal adiposity, and increased risk of disability and mortality (Santos et al., 2024). These changes may hinder the interpretation of the BMI of older adults because the loss of height results in a higher BMI or an overestimation of fat mass (Waters & Baumgartner, 2011). Nutritional status can be considered an SDH, as it is an indicator of living conditions, and in the present study, there was a negative correlation between BMI and muscle quality. A decrease in lean body mass is often compensated by increases in fat mass, often with a stable weight and BMI (Waters & Baumgartner, 2011). Newman et al. (2005) observed that when older adults lost and then regained weight, they experienced an overall net loss in lean mass. Marcus et al. (2012) reported that in elderly individuals, intramuscular fat (adipose cells within the muscle) was inversely related to physical performance.

The identification of factors that influence muscle quality is reflected in possible personalized interventions to reduce the prevalence of poor muscle quality associated with SDHs in aging. In addition, public policies are necessary for the care of the elderly population, especially regarding modifiable SDHs, stimulating functional independence and factors related to the preservation of muscle quality, development of capacity, and defense against accelerated aging, in addition to preventing multimorbidities and contributing to a better quality of life in this population. The identification of SDHs that can influence muscle quality in the elderly allows the evaluation of new preventive strategies for both individuals and populations, promoting healthy aging (Henly et al. 2011; WHO 2019).

The main limitation of our results is the cross-sectional design of the analyses. This design does not allow us to conclusions regarding the causal associations between muscle quality and SDHs, further hindering comparisons with other studies. Convenience sampling was employed in this study, considering the availability of individuals to be part of the sample in a given time interval. The participants were not classified based on the MQI because, as already mentioned, there are no validated cutoff values for the elderly population. Finally, devices more accurate than bioimpedance, such as DXA, magnetic resonance imaging, or computed tomography, could provide more useful information to understand better and characterize muscle quality (e.g., anatomical and physiological cross-sectional area and fat infiltration).

5. Conclusion

This study revealed that SDHs such as age, physical activity level, education level, and body mass index were associated with the muscle quality of elderly individuals, and the results confirmed that muscle quality decreases with age and indicated that muscle quality may be higher in physically active individuals with a lower BMI and higher education.

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