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THE IMPACT OF THE COVID-19 PANDEMIC ON PHYSICAL EXERCISE AND THE RISK OF THE DEVELOPING SARCOPENIA IN THE ELDERLY

O IMPACTO DA PANDEMIA DA COVID-19 NA PRÁTICA DE EXERCÍCIO FÍSICO E O RISCO DE DESENVOLVIMENTO DE SARCOPENIA EM IDOSOS

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Abstract: The objective of the study is to analyze the impact of the covid-19 pandemic on physical exercise and the risk of developing sarcopenia in community-dwelling elderly in the city of Joinville-SC. This is a cross-sectional qualitative-quantitative study. Screening instruments: Clock Drawing Test, Mini Nutritional Assessment. Anthropometric measurements: Body Mass Index, Total Muscle Mass Index, Calf and Abdominal Circumference. Functional tests: Timed Up and Go Test, Walking Speed Test. Muscle strength: Sit and Stand Test, Handgrip Strength and Quadriceps Femoral Strength. A total of 276 elderly people participated in the study, of which 28% contracted covid-19. When investigating sarcopenia, in women, 3.3% with sarcopenia and 46.7% with pre-sarcopenia, in men, 4.2% with sarcopenia and 35.4% with pre-sarcopenia. Regarding the practice of physical exercise, sedentary behavior predominated, being 39.4% of women and 43.7% of men. It is concluded that there is a strong influence of the covid-19 pandemic with increased sedentariness and the consequent negative health outcomes in the elderly

Keywords: Aged; Sarcopenia; Exercise; Covid-19.

Resumo: O objetivo do estudo é analisar o impacto da pandemia da covid-19 na prática de exercício físico e o risco de desenvolvimento de sarcopenia de idosos comunitários da cidade de Joinville-SC. Trata-se de um estudo qualiquantitativo de caráter transversal. Instrumentos de triagem: Teste do Desenho do Relógio, Mini Avaliação Nutricional. Medidas antropométricas: Índice de Massa Corporal, Massa Muscular Total, Índice de Massa Muscular Total, Circunferência de panturrilha e abdominal. Testes funcionais: *Timed Up and Go Test*, Teste de Velocidade de Marcha. Força muscular: Teste de Sentar e Levantar, Força de Preensão Manual e Força de Quadríceps Femoral. Participaram do estudo 276 idosos, dos quais 28% contraíram a covid-19. Ao investigar a sarcopenia, nas mulheres, 3,3% com sarcopenia e 46,7% com pré-sarcopenia, nos homens, 4,2% com sarcopenia e 35,4% com pré-sarcopenia. Com relação a prática de exercício físico o comportamento sedentário predominou, sendo 39,4% das mulheres e 43,7% dos homens. Conclui-se que existe uma forte influência da pandemia da covid-19 com aumento do sedentarismo e os consequentes desfechos negativos sobre a saúde dos idosos.

Palavras-chave: Idosos; Sarcopenia; Exercício Físico; Covid-19.

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INTRODUÇÃO

At the end of 2019, an outbreak of pneumonia of unknown cause began in China, and it was not until early January that a new coronavirus, called covid-19, was identified that has been causing a severe acute respiratory syndrome (GORBALENYA et al., 2020; MOHAMADIAN et al., 2021; YESUDHAS; SRIVASTAVA; GROMIHA, 2021; ZHOU et al., 2020). People diagnosed with covid-19, have myalgias and muscle loss, which when associated with rest can develop sarcopenia (CASEY; ANG; SULTAN, 2021; MORLEY; KALANTAR-ZADEH; ANKER, 2020). Sarcopenia then is defined as a reduction in muscle strength and mass (CRUZ-JENTOFT et al., 2019). This disease can be classified as either primary, which is age-related, or secondary, which is related to a chronic disease (MORLEY; KALANTAR-ZADEH; ANKER, 2020).

Knowing that elderly people are a risk factor for covid-19 ("Coronavirus disease 2019 (COVID-19) - Symptoms, diagnosis and treatment | BMJ Best Practice", [s.d.]). When talking about aging, we know that its process happens naturally in the life of the human being, and with it the appearance of modifications, among them, the redistribution of body fat and the reduction of muscle mass that induces muscle hypotrophy, having a direct impact on the physical performance of the elderly (MARQUES et al., 2019; PAULA et al., 2016; SILVA; PEDRAZA; MENEZES, 2015).

In view of this, Physical Exercise (PE) is one of the most prescribed therapies for both health maintenance and disease treatment (SALLIS et al., 2021; WOODS et al., 2020). However, the practice of PE has been reduced due to the pandemic of covid-19, isolation and social withdrawal, and with this, there has been an increase in the time of physical inactivity, a factor that directly affects the health of the elderly (SALLIS et al., 2021; WOODS et al., 2020). PE brings as benefits the promotion of health, disease prevention, treatment and reduction of the effects caused by covid-19 (ALVARENGA, 2020; MONTEIRO JÚNIOR, 2020). Regarding its recommendation for the elderly population is 150 minutes per week, with moderate to vigorous intensity (MELLO; FREITAS, 2020).

Thus, the central objective of this study is to analyze the impact of the covid-19 pandemic on physical exercise and the risk of developing sarcopenia in community-dwelling elderly in the city of Joinville-SC.

METHODOLOGY

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This is a cross-sectional qualitative and quantitative study, including elderly people registered at the nine Reference Centers for Social Assistance (CRAS), linked to the Secretariat of Social Assistance of the Municipality of Joinville/SC, which houses the Municipal Council for the Rights of the Elderly (CIMDI). The exclusion criteria were the elderly who had physical limitations for the functional tests, as well as cognitive impairment, assessed by the Clock Drawing Test (CDT) (ATALAIA-SILVA; LOURENÇO, 2008; SUNDERLAND et al., 1989), and those who refused to do any of the research procedures, or who did not sign the Free and Informed Consent Form. The research project was approved by the Research Ethics Committee (REC) of the University of Joinville Region (UNIVILLE), under opinion 4.593.78.

First, the elderly was given lectures on the subject, and after signing the Free and Informed Consent Form, the evaluations began, using a brief form prepared by the researchers, composed of data on age, sex, ethnicity, marital status, education, and comorbidities, and then the tests were performed.

The Clock Drawing Test (RDT) for the identification of cognitive impairment in the elderly (ATALAIA-SILVA; LOURENÇO, 2008). The Geriatric Depression Scale (GDS), for the identification of depressive traits in the elderly (ALMEIDA; ALMEIDA, 1999). Mini Nutritional Assessment, for the identification of malnutrition (RUBENSTEIN et al., 2001). To assess the practice of PE, we used the IPAQ adapted for the elderly, in domains 2 (physical activity as a means of transportation) and 4 (leisure activities, recreation and sports (LEE et al., 2011). Participants were asked about their normal weekly routine, from Monday to Sunday, during the periods of the day (morning/afternoon/evening), and how much in minutes they perform the activity in question, which took at least 10 minutes or more, interrupted.

As anthropometric measurements, weight was taken using a digital scale with 50g resolution (Model 2096PP, Toledo®, BR) and height was measured using a stadiometer with 1mm resolution (Model ES2020, Sanny®, BR). From these measurements, the Body Mass Index (BMI) was obtained by the ratio of body mass and height squared (kg/m2). The classification proposed by the Nutrition Screening Initiative for Brazilian elderly, according to recommendations of the Food and Nutrition Surveillance System (SISVAN), indicates low weight with BMI <22 kg/m2, eutrophic 22 to 27 kg/m2 and overweight >27 kg/m2 (SOARES; et al., 2019). Total Muscle Mass (TMM) and Total Muscle Mass Index (TMMI) were assessed using the Lee Equation (LEE, 2000), which defines TMMI from body weight, height, age, gender, and ethnicity (RECH et al., 2012). The TMMI ranges from 5.9 to 9.5 kg.m-2 and is established by TMMI (kg.m-2) = TMM / E2, where S = stature (meters) and MMT = d

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0.244.BW + 7.80.H1 - 0.098.A + 6.6.G + Et - 3.3. Where BW = body weight (kg); H1 = height (meters); A = age (years); G = gender (female = 0 and male = 1; Et = ethnicity (Caucasian = 0, Asian = -1.2; African descent = 1.4) (GOBBO et al., 2012).

Calf circumference (CC) was measured with an inextensible and inelastic tape (Sanny® brand, BR), with the individual positioned standing, with a distance of 20cm between the feet, at the maximum circumference in the plane perpendicular to the longitudinal line of the calf (PAGOTTO et al., 2018). Values below 33cm for women and 34cm for men, indicate reduced muscle mass (PAGOTTO et al., 2018). Abdominal Circumference (AC), was performed with the same tape and position, adding the crossed arms on the upper chest region. The measurement was made at the midpoint between the last intercostal arch and the iliac crest at the end of a normal expiration (BILORIA et al., 2017). Two measurements were taken, averaged between them. For cut-off values, above 88cm for women and above 102c for men, indicate abdominal obesity (ALEXANDRE et al., 2018).

For muscle strength tests, the Sit and Stand Test (SST), time >15 seconds indicate reduced muscle strength (CRUZ-JENTOFT et al., 2019). The Manual Handgrip Strength (MHS), a TAKEI® dynamometer was used as recommended by the American Association of Hand Therapists (SOARES et al., 2017). The cut-off point values that diagnose dynapenia in the Brazilian population are <30 kgf for men and <20 kgf for women (MARQUES et al., 2019). Two measurements were collected, and the one with the best result was chosen. For Quadriceps Femoral Strength (QFS), on the other hand, a portable multi-articular dynamometer (Handheld - CHATILLON®, Ametek, USA) was used. The elderly individual was instructed to sit on a stretcher, so that his legs were hanging down, with the knee at 90 degrees, the equipment was positioned just above the ankle region, with the help of stabilization equipment produced by the researchers. Finally, the individual was instructed to maintain isometric contraction of the quadriceps femoris for approximately 3 to 5 seconds. Two measurements were taken, and the best one was used. No Brazilian studies were found that contain the reference values for this variable (BENFICA et al., 2018).

For functional assessment the tests, Timed Up and Go Test (TUG) were performed, a time greater than 20 seconds were considered low physical performance (CRUZ-JENTOFT et al., 2019). Finally, the Gait Velocity Test (GVT), the cut-off point being <0.8 m/s which indicate severe sarcopenia (CRUZ-JENTOFT et al., 2019).

For data analysis, they were performed in GraphPad Prism 8® software. The normality was verified by the Shapiro-Wilk test. To verify the differences between the groups classified

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as community-dwelling, active, and sedentary elderly, Student's t test was applied for parametric data and Wilcoxon test for non-parametric data. Comparisons were made between men and women. Then divisions as the percentage of sarcopenic, pre-sarcopenic and non-sarcopenic elderly, with to the level of PE practice of those elderly with and without covid-19. Soon after, a classification with the level of PE, being Group 1 (G1) practicing PE >150 minutes/week; Group 2 (G2) <150 minutes/week; Group 3 (G3) sedentary. For this analysis the ANOVA test with Welch correction was done, for parametric data, and for non-parametric data the Kruskal-Wallis test. For all tests a significance level of 95% was adopted ($p<0.05$). And at the end, a percentage with respect to the comorbidities associated with the participants who presented covid-19, and also with its relation to the time of PE.

RESULTS

In this study 281 elderly people were evaluated. However, five of them were excluded due to physical incapacity to perform the functional tests. Thus, 276 participants were included in the research (180 women and 96 men), belonging to several neighborhoods of the city of Joinville/SC, reached in all regions of the city.

With regard to the classification of sarcopenia, it was possible to verify that 4.2% of men and 3.3% of women presented sarcopenia. As for pre-sarcopenic it was possible to analyze higher percentages, 35.4% of men and 46.7% of women.

When talking about covid-19, 28% of the elderly presented a positive diagnosis for the disease. And when compared to PE, about 10.4% (men) and 15% (women) were considered sedentary. Regarding the elderly without covid-19, 33.3% (men) and 24.4% (women) were classified as sedentary.

Table 1 shows that there was a statistical difference in the TUG test (G1/G2: p 0.048; G1/G3: p 0.040), the QFS test (G1/G2: p 0.005; G1/G3: p 0.003), and the GVT test (p 0.003), with G1 showing better results in all tests when compared to the other groups.

Table 1 - Comparison between the 3 groups of women without covid-19

VARIABLES	G1 (n=46) M (SD)	G2 (n=37) M (SD)	G3 (n=44) M (SD)	Value of p
AGE (years)	69,5 (±5,5)	71,9 (±7,6)	72,8 (± 7,5)	0,072
BMI (kg/m^2)	27,8 (±3,8)	28,5 (±4,7)	29,3 (±5,4)	0,342
TMMI (kg.m^{-2})	7,7 (±0,9)	7,7 (±1,3)	7,9 (±1,3)	0,461

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AC (cm)	96,2 (±10,3)	99,2 (±11,5)	99,7 (±11,2)	0,266
CC (cm)	38,5 (±3,6)	38,5 (±3,7)	38,5 (±4,2)	0,994
TUG (s)	7,7 (±1,3)	8,7 (±2,1)	8,7 (±2,5)	**G1<G2 0,048 G1<G3 0,040**
GVT (m/s)	1,6 (±0,2)	1,4 (±0,3)	1,4 (±0,3)	**G1>G3 0,003**
SST (s)	10,8 (±3,4)	11,9 (±3,4)	11,8 (±4,9)	0,329
MHS (kgf)	22,7 (±3,6)	21,1 (±5,3)	21,0 (±4,8)	0,129
QFS (kgf)	24,8 (±6,8)	20,5 (±6,2)	20,4 (±5,3)	**G1>G2 0,005 G1>G3 0,003**
MNA	12,8 (±1,6)	12,2 (±1,9)	12,6 (±2,0)	0,353

Legend: G1: exercisers >150 minutes of physical exercise; **G2**: <150 minutes of physical exercise; **G3**: sedentary; **M**, mean; **SD**, standard deviation; **N:** number; **BMI**, body mass index; **TMMI**, total muscle mass index; **AC**, abdominal circumference; **CC**, calf circumference; **TUG**, timed up and go test; **GVT**, gait velocity test; **SST**, sit and stand test; **MHS**, manual handgrip strength; **QFS**, quadriceps femoral strength; **MNA**, Mini nutritional assessment; ***** significant difference by test *t* Student, with correction for Welch (p<0,05).

Table 2 - Comparison between the 3 groups of men without covid-19

VARIABLES	G1 (n=26) M (SD)	G2 (n=15) M (SD)	G3 (n=30) M (SD)	Value of p
AGE (years)	70,2 (±6,3)	73,9 (±5,8)	72,1 (±5,7)	0,159
BMI (kg/m^2)	27,8 (±3,6)	27,6 (±4,0)	28,8 (±4,9)	0,518
TMMI (kg.m^{-2})	10,2 (±0,9)	10,1 (±0,9)	10,4 (±1,2)	0,587
AC (cm)	102,0 (±11,3)	102,0 (±11,6)	105,0 (±14,2)	0,554
CC (cm)	38,7 (±3,0)	37,5 (±3,1)	38,5 (±3,8)	0,502
TUG (s)	7,5 (±1,3)	8,0 (±1,9)	9,3 (±2,4)	**G1<G3 0,003**
GVT (m/s)	1,7 (±0,3)	1,5 (±0,3)	1,4 (±0,3)	**G1>G3 0,001**
SST (s)	10,0 (±3,1)	11,3 (±3,6)	12,9 (±3,6)	**G1<G3 0,008**
MHS (kgf)	37,5 (±8,2)	32,6 (±3,4)	31,6 (±7,5)	**G1>G3 0,008**
QFS (kgf)	35,7 (±9,8)	30,1 (±7,1)	28,7 (±8,4)	**G1>G3 0,010**
MNA	13,2 (±1,2)	13,5 (±1,1)	12,7 (±2,5)	0,343

Legend: G1: exercisers >150 minutes of physical exercise; **G2**: <150 minutes of physical exercise; **G3**: sedentary; **M**, mean; **SD**, standard deviation; **N:** number; **BMI**, body mass index; **TMMI**, total muscle mass index; **AC**, abdominal circumference; **CC**, calf circumference; **TUG**, timed up and go test; **GVT**, gait velocity test; **SST**, sit and stand test; **MHS**, manual handgrip strength; **QFS**, quadriceps femoral strength; **MNA**, Mini nutritional assessment; ***** significant difference by test *t* Student, with correction for Welch (p<0,05).

In table 2, when comparing the men without covid-19, and its relation with the time of PE, it is possible to verify that in the tests of TUG (p 0.003), TVM (p 0.001), SST (p 0.008),

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MHS (p 0.008), and QFS (p 0.010), G1 presented better results when compared to the groups G2 and G3.

In table 3, when comparing women diagnosed with covid-19 in relation to their time of PE practice, it was observed that in the body evaluation with the AC variable (G1/G2: p 0.050; G1/G3: p 0.018), with G1 showing a lower AC when analyzed with the other groups. When evaluating the CC variable, G2 (p 0.037) showed significant results when compared to G3. In the TUG (p 0.049), G1 showed significant results when compared to the other groups. In table 4, when comparing men with positive diagnosis for covid-19 with respect to the time of PE practice, it was observed that regarding QFS, G1 and G2 showed better results when compared to G3 (p 0.017).

Table 3 - Comparison between the 3 groups of women with covid-19

VARIABLES	G1 (n=13) M (SD)	G2 (n=13) M (SD)	G3 (n=27) M (SD)	Value of p
AGE (years)	66,5 (±4,5)	71,7 (±4,3)	69,2 (±6,7)	0,075
BMI (kg/m^2)	28,0 (±3,0)	28,6 (±4,6)	31,4 (±5,5)	0,065
TMMI (kg.m^{-2})	7,7 (±0,6)	7,8 (±1,1)	8,5 (±1,4)	0,069
AC (cm)	94,3 (±8,3)	103,0 (±10,2)	103,0 (±9,9)	**G1<G2 0,050 G1<G3 0,018**
CC (cm)	37,3 (±1,6)	36,9 (±2,6)	40,1 (±4,6)	**G2<G3 0,037**
TUG (s)	7,5 (±1,2)	8,3 (±1,6)	9,8 (±3,7)	**G1<G3 0,049**
GVT (m/s)	1,5 (±0,3)	1,4 (±0,2)	1,3 (±0,3)	0,166
SST (s)	12,9 (±3,8)	12,4 (±3,0)	13,6 (±6,0)	0,772
MHS (kgf)	22,7 (±5,5)	21,8 (±3,9)	22,2 (±4,2)	0,127
QFS (kgf)	21,4 (±4,1)	20,3 (±3,6)	19,8 (±6,9)	0,707
MNA	12,8 (±1,3)	13,0 (±2,0)	12,4 (±1,8)	0,266

Legend: G1: exercisers >150 minutes of physical exercise; **G2**: <150 minutes of physical exercise; **G3**: sedentary; **M**, mean; **SD**, standard deviation; **N:** number; **BMI**, body mass index; **TMMI**, total muscle mass index; **AC**, abdominal circumference; **CC**, calf circumference; **TUG**, timed up and go test; **GVT**, gait velocity test; **SST**, sit and stand test; **MHS**, manual handgrip strength; **QFS**, quadriceps femoral strength; **MNA**, Mini nutritional assessment; ***** significant difference by Student's *t* test with correction for Welch (p<0,05).

When the relationship between comorbidities and participants with and without covid-19 was analyzed, it was possible to analyze those elderly women who obtained a covid-19 diagnosis presented the highest percentages, systemic arterial hypertension (75%), diabetes

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mellitus (35.5%), stroke (9.2%), cardiovascular diseases (21.1%), and obesity (71.1%). It is worth noting that in the group without covid-19, the comorbidities of systemic arterial hypertension (58.0%), and obesity (57.5%) showed high percentages.

Finally, when the comorbidities and their connection to the time of PE were observed, the main findings of this analysis were related to G3, which showed higher percentages in relation to comorbidities, in systemic arterial hypertension it was observed that 26.8% were sedentary, 12.3% had diabetes mellitus, 8.7% had cardiovascular diseases, and about 28.3% were obese.

Table 4 - Comparison between the 3 groups of men with covid-19

VARIABLES	G1 (n=6) M (SD)	G2 (n=7) M (SD)	G3 (n=12) M (SD)	Value of p
AGE (years)	70,2 (±5,7)	71,6 (±7,6)	71,8 (±4,9)	0,861
BMI (kg/m^2)	32,6 (±4,8)	33,5 (±8,2)	30,4 (±4,8)	0,516
TMMI (kg.m^{-2})	11,4 (±1,1)	11,4 (±2,1)	10,8 (±1,2)	0,472
AC (cm)	117,0 (±10,3)	118,0 (±16,0)	110,0 (±12,6)	0,425
CC (cm)	41,7 (±2,9)	42,5 (±7,3)	39,1 (±3,9)	0,316
TUG (s)	7,5 (±1,0)	9,4 (±2,0)	8,6 (±1,8)	0,148
GVT (m/s)	1,6 (±0,3)	1,4 (±0,3)	1,5 (±0,2)	0,245
SST (s)	11,3 (±1,9)	12,9 (±2,5)	13,0 (±3,6)	0,493
MHS (kgf)	40,8 (±9,8)$^{\alpha}$	34,3 (±9,7)	32,2 (±6,7)	0,141
QFS (kgf)	37,3 (±7,4)	39,5 (±9,9)	27,7 (±7,7)	**G1 e G2 >G3 0,017**
MNA	12,5 (±2,0)	12,1 (±2,3)	13,3 (±1,2)	0,482

Legend: G1: exercisers >150 minutes of physical exercise; **G2**: <150 minutes of physical exercise; **G3**: sedentary; **M**, mean; **SD**, standard deviation; **N:** number; **BMI**, body mass index; **TMMI**, total muscle mass index; **AC**, abdominal circumference; **CC**, calf circumference; **TUG**, timed up and go test; **GVT**, gait velocity test; **SST**, sit and stand test; **MHS**, manual handgrip strength; **QFS**, quadriceps femoral strength; **MNA**, Mini nutritional assessment; ***** significant difference by test *t* Student, with correction for Welch (p<0,05).

DISCUSSION

In this research we used as criteria for the evaluation of sarcopenia, anthropometric data such as weight, height, BMI, TMMI, AC, and CC, thus allowing the identification of overweight and obesity in this population; for the muscle strength data we used the MHS, QFS,

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and SST tests, and for the analysis of functional performance the tests applied were the TUG and GVT.

When talking about the prevalence of sarcopenia, the participants indicate low rates when being considered sarcopenic elderly, in men 4.2%, and in women 3.3%, it is believed because they are independent community elderly. Studies that collaborate with this research are, a systematic review containing 34,955 older adults demonstrates a worldwide prevalence of sarcopenia between 9-11% (PAPADOPOULOU et al., 2020). Another review of 7,710 community-dwelling elderly Brazilians found a 15% prevalence of sarcopenic elderly (LIMA, 2021). That is, community-dwelling elderly people tend to have higher sarcopenia rates because they have less active behaviors (LIMA, 2021).

Regarding the elderly considered pre-sarcopenic, the present study showed a prevalence of 35.4% in men and 46.7% in women. Collaborating with the findings, a study showed a prevalence of 50% of the studied population were classified as probable sarcopenia (SILVA; SANTOS, 2020). This condition is directly related to muscle strength, being a consequence of aging, which becomes an important determinant for a possible diagnosis (PONTES, 2022; TIELAND; TROUWBORST; CLARK, 2018).

Sarcopenia can also develop secondarily to covid-19 due to long periods of hospitalization and social isolation (CASEY; ANG; SULTAN, 2021; MORLEY; KALANTAR-ZADEH; ANKER, 2020). In the present research, it was observed that 28% of the evaluated elderly had a positive diagnosis for covid-19. And its relationship with the practice of PE, it was possible to verify that 10.4% of men and 15% of women were considered sedentary. One of the factors that may be linked to the increase in these percentages of reduced PE practice is social isolation, which was used as a protective measure in order to reduce the proliferation of the virus (PITANGA; BECK; PITANGA, 2020; SILVA; SAFONS, 2022). Collaborating with the findings of this research, a study that evaluated 39,693 individuals, brought in its results an increase of 26% in physical inactivity during the period of social isolation (SILVA et al., 2021). Another study brings about the importance of a PE program, especially during the period of social withdrawal, in addition to other healthy habits, which aims to improve health, since they are important risk factors for several diseases, including covid-19 (SILVA; SAFONS, 2022).

Regarding the body composition of the elderly studied, G1 showed a lower AC when compared with the other groups. A study that contains 109,881 participants with covid-19, brings in its results that obesity is related to a higher risk of contracting the covid-19 disease in

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its most critical form and increased mortality, especially in those over 60 years, requiring more attention during hospitalization (DU et al., 2021). Another important factor is that adiposity directly impacts the performance of activities of daily living, requiring the encouragement of these elderly to practice PE (RAMÍREZ-VÉLEZ et al., 2020).

Regarding muscle strength, in the current study it was possible to verify that the QFS was higher in the groups that performed more than 150 minutes of PE per week. Thus, a study verifies the use of a Handheld dynamometer and concludes that it is a reliable resource to be used to measure QFS (PINTO-RAMOS et al., 2022). Corroborating with this research, a systematic review with meta-analysis brings that different types of PE can effectively improve muscle function and thus physical performance in older adults with sarcopenia (WANG; HUANG; ZHAO, 2022). And yet, the study by (KARA et al., 2021)), exposes in its results that the anterior thigh muscles suffer atrophy earlier when compared to other muscles, being the region that can provide faster information about sarcopenia.

In the MHS, it was possible to verify the same results, with G1 being the group that demonstrated greater muscle strength when compared to the other groups. However in the group of men with covid-19, there was no significant data, but it is possible to visualize a minimal clinically important difference of 5 to 6.5 kg between the groups (BOHANNON, 2019). The study by (LUNT et al., 2021), brings information from their systematic review that MHS is linked to mobility, balance, and performing activities of daily living. Social isolation stemming from the covid-19 pandemic is also known to impact functional mobility and muscle strength in the elderly (ANGELO et al., 2022).

In the SST, it was possible to verify in this study that G1 presented better results when compared to the other groups. Collaborating with our findings, the systematic review and meta-analysis of (SOLIS-NAVARRO et al., 2022), observed that there was a significant improvement in the functional performance of these elderly.

When studying the functional performance in the groups with and without covid-19, the TUG and the GVT showed significant results in G1 when compared to the other groups. Contributing to our study, the systematic review with meta-analysis of (LU et al., 2021) containing 1,191 sarcopenic elderly who analyzed different PE programs, and at the end, showed better results in functional tests. Further contributing to the study, Lee et al., (2018), demonstrated in their studies that physical activity is an effective strategy for sarcopenia, having significant improvements in muscle strength and physical performance. Regarding individuals with covid-19, the research by (BEAUCHAMP et al., 2022), containing 51,338 individuals

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living in the community, reports that positive diagnosis for covid-19 in mild or moderate forms are associated with worsening functional mobility.

It is known that both functional performance and body composition are associated with comorbidities (IZQUIERDO et al., 2021). It is possible to verify in the current research that the elderly who had a positive diagnosis for covid-19 had higher percentages of comorbidities. (THAKUR et al., 2021) in his systematic review, with 125,446 participants, shows that the main comorbidities associated with covid-19 are hypertension, obesity, diabetes, and cardiovascular diseases, among other alterations. Another study, with a total of 281,461 individuals with covid-19 showed similar comorbidities, and in the end concluded that these comorbidities are involved with a higher risk of developing covid-19 in the most severe form (LI et al., 2021).

And when verifying the comorbidities and the practice of PE, it was possible to verify that in all variables the elderly who were considered sedentary showed worse results. Corroborating our findings, (BRICCA et al., 2020), demonstrated an improvement in multimorbidities when performing a PE intervention. The study by (JAKICIC et al., 2019), brings the importance of the practice of PE regardless of the duration, it brings health benefits, including mortality. (DELPINO et al., 2022), also says in their studies that low levels of PE are associated with a higher risk of developing comorbidities in older people.

CONCLUSION

This study brings significant contributions about the impact of the covid-19 pandemic on physical exercise and the risk of developing sarcopenia in community-dwelling elderly. It also highlights the potential negative influence of the covid-19 pandemic reflected in the increase in sedentary lifestyles, the significant number of overweight and obese elderly, and also an alarming number of pre-sarcopenic elderly.

The study presents some limitations in relation to some tests/measures that still generate controversy, such as the measurements of knee extensor muscle strength, because there are no normative values for the Brazilian population. Other measurements that are recommended and widely found in several studies, such as calf circumference, body mass index, and total muscle mass index, have limitations regarding their accuracy. Thus, the comparison of these findings with more precise measuring instruments may be interesting in future studies.

The results of this research can substantially contribute to the development of new strategies aimed at reversing the state of sarcopenia or pre-sarcopenia, because, even though it is a progressive and highly disabling morbid condition, most cases are treatable. Therefore,

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there is the possibility of creating programs focused on healthy dietary control and weight loss, as well as the systematic practice of physical exercise aimed at the integral health of the elderly population.

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