

RELATION BETWEEN HANDGRIP STRENGTH AND LONELINESS IN COMMUNITY-DWELLING OLDER PEOPLE

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ABSTRACT

Background: Handgrip strength (HGS) is associated with older people's functional independence, facilitating autonomous living and active participation in daily, professional and social activities. HGS is an essential indicator of overall physical and functional capacity, playing a fundamental role in promoting independence and well-being. Loneliness has been associated with loss of functional capacity. **Objectives:** To assess handgrip strength and analyse its relationship with the level of loneliness. **Methods:** A descriptive-correlational, cross-sectional study was conducted using a convenience sample of 33 older people (≥ 65 years), 82% female, with a mean age of 70.85 (± 6.99) years. HGS was measured using a Baseline BIMS dynamometer and loneliness was assessed using the UCLA Loneliness Scale validated for the Portuguese population. Correlations between HGS and loneliness score were analysed. **Results:** Mean non-dominant handgrip strength (NDHGS) was 24.05 (± 6.86) kg in males and 28.40 (± 15.8) kg in females. Although a trend towards a negative correlation between loneliness and handgrip strength was observed, this correlation was not statistically significant. **Conclusion:** A correlation between loneliness and handgrip strength in older adults cannot be established. Nevertheless, handgrip strength remains a useful measure for identifying the risk of physical decline. Further studies are needed to clarify the interactions between handgrip strength and loneliness.

Keywords: handgrip strength, older people, loneliness, community.

RELAÇÃO ENTRE FORÇA DE PREENSÃO MANUAL E SOLIDÃO EM IDOSOS DA COMUNIDADE

RESUMO

Enquadramento: A força de preensão manual (FPM) associa-se à independência funcional da pessoa idosa, facilitando uma vida autónoma e a participação ativa nas atividades diárias, profissionais e sociais. A FPM constitui um indicador da capacidade física e funcional global, com relevância para a promoção da independência e do bem-estar. A solidão tem sido associada à perda de capacidade funcional. **Objetivos:** Avaliar a força de preensão manual e analisar a relação entre a preensão manual e o nível de solidão. **Métodos:** Realizou-se um estudo descritivo-correlacional, de corte transversal, com amostra de conveniência constituída por 33 pessoas idosas (≥ 65 anos), 82% do sexo feminino, com média de idade de 70,85 ($\pm 6,99$) anos. A FPM foi medida com um dinamómetro Baseline BIMS e

a solidão foi avaliada através da UCLA Loneliness Scale (versão validada para a população portuguesa). Analisaram-se correlações entre a FPM e a pontuação de solidão. **Resultados:** A média da força de preensão da mão não dominante (FPMND) foi de 24,05 ($\pm 6,86$) kg no sexo masculino e 28,40 ($\pm 15,8$) kg no sexo feminino. Embora se observe uma tendência para uma correlação negativa entre a solidão e a força de preensão manual, esta não se mostrou estatisticamente significativa. **Conclusão:** Não é possível estabelecer uma correlação entre solidão e força de preensão manual em pessoas idosas. Ainda assim, a FPM mantém utilidade como medida para identificação do risco de declínio físico. São necessários estudos adicionais para clarificar as interações entre FPM e solidão.

Palavras-chave: força de preensão manual, pessoas idosas, solidão, comunidade.

1 INTRODUCTION

The older population in Portugal has been increasing, consolidating the pressure on the health and social security systems (INE - Instituto Nacional de Estatística, 2024). Ageing is a natural process characterised by progressive changes in the structure and function of tissues and organs, resulting in reduced muscle strength (Bilajac et al., 2020), reduced cognitive and sensory capacity (Amarya et al., 2018), cardiovascular decline (Khan et al., 2017), and deterioration of balance and gait, thereby increasing the risk of falls (Osoba et al., 2019).

Health assessment of older adults should consider functional capacity, a powerful predictor of mortality in this age group (Qiu et al, 2023). Functional capacity can be defined as the ability to perform activities of daily living and is influenced by advanced age, low educational attainment, and physical inactivity (Bonardi et al., 2007). Reduced functional capacity limits older adults' autonomy in multiple activities, which may contribute to loneliness and significantly reduce quality of life (Bonardi et al., 2007; Wiśniowska-Szurlej et al., 2021).

Among tests used to assess functional capacity, the handgrip strength (HGS) is widely used in research due to its ease of application and effectiveness as a biomarker of ageing (Bohannon, 2019). This test helps identify vulnerable older adults, enabling the planning of preventive health services to reduce the risk of dependency and functional limitations. In addition, a negative correlation between age and HGS has been observed, as well as a positive correlation between the ability to perform activities of daily living and HGS (McGrath et al., 2018). These results suggest that poor performance in activities such as rising from a chair, walking and climbing stairs is associated with lower HGS in older adults (Wiśniowska-Szurlej et al., 2021). Loneliness can be considered a risk factor for accelerated physical decline (Crewdson, 2016). It is a subjective feeling of distress that arises when there is a discrepancy between desired and actual social relationships and has been associated with decreased functional capacity (Yu et al., 2020). Older adults who are widowed, divorced or single are more vulnerable and require more care, increasing the need for public interventions (Wiśniowska-Szurlej et al., 2021). According to Buchman et al. (2010), an increase in loneliness, assessed by the Jong-Gierveld scale, is associated with increased motor decline.

The aim of this work was to assess handgrip strength in older adults, men and women, participating in the "DigiHealth – Intergenerational Digital Health", a project designed to promote digital health literacy in older adults, carried out in the municipality of Vila Nova de Gaia, Portugal. The central objective of the study was to analyse the relationship between handgrip strength test results and the level of loneliness in these older adults.

2 METHODOLOGY

2.1 Study design

A cross-sectional descriptive-correlational study was conducted in Vila Nova de Gaia with community-dwelling older adults between October and December 2023.

2.2 Sample

The sample comprised 33 older adults aged 65 years or over, of both sexes, community-dwelling, residing in the municipality of Gaia. The participants were selected based on convenience, and all were taking part in the “DigiHealth” project. Older adults who were able to perform a handgrip squeeze with at least one hand were included. Older adults with cognitive or neurological impairment preventing them from following instructions, those at high cardiovascular risk as assessed by the Physical Activity Readiness Questionnaire (PAR-Q) (Luz et al., 2007), and those without independent walking ability were excluded.

Sample characteristics stratified by sex are summarised in Table 1. Ages ranged from 65 to 89 years. Mean age was 78.5 (± 6.804) years for men and 70.85 (± 6.993) years for women. The difference in mean age between men and women was significant ($p < 0.001$). Women comprised the majority of the sample (81,8%). The mean height of male participants was 165.33 (± 6.83) cm and of female participants 158.41 (± 7.07) cm; the difference in means between these two groups was statistically significant ($p < 0.001$).

Table 1 – Sample characterisation

Variables	Male	Female
N (%)	6 (18,2%)	27 (81,8%)
Age (years)	78,50 $\pm$ 6,80	70,85 $\pm$ 6,99
Height (cm)	165,33 $\pm$ 6,83	158,41 $\pm$ 7,07

2.3 Instruments

PAR-Q

All participants completed the Physical Activity Readiness Questionnaire (PAR-Q), designed to manage risks associated with moderate-intensity physical activity. The PAR-Q includes questions about heart problems, chest pain during physical activity, dizziness, joint pain, and medication use (Luz et al., 2007). This instrument was used for sample definition.

Handgrip strength (HGS)

Handgrip strength was assessed using the American Society of Hand Therapists (ASHT) testing protocol, with the participant seated, shoulder adducted, elbow flexed at 90 degrees, forearm in neutral position, and wrist between 0 and 30 degrees of extension (Fess, 1992). HGS was measured using a Baseline BIMS dynamometer (Baseline 12-0070: BIMS Digital 5-Position Grip Dynamometer, Clinic Model). Each participant performed three 3-second maximal contractions for each hand, with a 1-minute rest between trials. Results were recorded based on the highest value of the three attempts for each hand and expressed in kilograms. If any participant was unable to perform the test with one of the hands (dominant or non-dominant), only the assessment of one hand was considered. Collected values were compared with reference values for the Portuguese population obtained by Mendes et al. (2017).

Measurement of non-dominant handgrip strength (NDHGS) was chosen because values from the dominant hand tend to be more influenced by occupational load. Occupational load may lead both to localised muscular development and to excessive stress on joints. Thus, the non-dominant hand may provide a more accurate measure of overall muscular strength without significant interference from work-related activities (Koh et al., 2015).

UCLA - Loneliness Scale for Portuguese older adults

To assess loneliness levels, the UCLA Loneliness Scale validated for the Portuguese older adult population by Pocinho et al. (2010) was used. The instrument comprises 16 items rated on a four-point Likert scale (from “never” to “frequently”), with higher scores indicating more frequent subjective feelings of loneliness. The scale has two factors (Social Isolation and Affinities), with eigenvalues greater than 1, explaining 51% of total variance. It shows very good internal consistency (Cronbach’s alpha of 0.905 for the total scale; 0.867 for the Social Isolation subscale; 0.806 for the Affinities subscale). A cut-off value of 32 points was established for Portuguese older adults; a total score >32 indicates the presence of intense feelings of loneliness (Pocinho et al., 2010).

2.4 Procedures

Data collection took place in October 2023 at three different community institutions: Canelas Senior Academy, University of Grandparents in Grijó, and Canelas Humanitarian Solidarity Association.

Data was collected by under graduation Physiotherapy students (third year), who had received prior training and were supervised by senior researchers.

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS, version 28.0). A significance level of $p < 0.05$ was adopted. The normality of the distribution was assessed using the Kolmogorov–Smirnov test. Based on this verification and the small sample size, parametric and/or non-parametric tests were selected as appropriate. Spearman’s correlation coefficient was used to analyse the relationship between FPMND and loneliness. For comparisons of means between two groups, Student’s t-test was used when the assumptions for its application were met.

This study is part of the “DigiHealth – Intergenerational Digital Health” project, which received a favourable opinion from the Ethics Committee of Instituto Piaget (Reference: P44-566-11/10/2023). All participants took part voluntarily and signed informed consent. Data confidentiality was guaranteed, and all principles of the Declaration of Helsinki were respected.

3 RESULTS

In regard to handgrip assessment, table 2 presents descriptives values and sex comparisons. Mean HGS among male participants was 23.14 (± 4.42) kg for the right hand and 24.05 (± 6.86) kg for the left hand. For the right hand, the calculated Cohen’s d was 0.43, which represents a small-to-moderate effect size. For female participants, the mean was 28.54 (± 13.55) kg for the right hand and 28.62 (± 16.12) kg for the left hand. Data show higher mean HGS in women than in men, although these differences were not statistically significant. Mean NDHGS in men was 24.05 (± 6.86) kg, a lower value and statistically significant ($p < 0.001$) when compared with the mean in women, 28.40 (± 15.80) kg. Regarding loneliness experience, a significantly higher mean ($p < 0.001$) was observed in men (41.83 ± 7.28) compared with women (35.59 ± 10.79).

Table 2 – HGS Assessment – Descriptives and sex comparisons

Variables	Male	Female	<i>p</i> (Student's t-test))
HGS right hand (kg)	23,14 ± 4,42	28,54 ± 13,55	
HGS left hand (kg)	24,05 ± 6,86	28,62 ± 16,12	
NDHGS (kg)	24,05 ± 6,86	28,40 ± 15,8	<0,001

Age-stratified analysis considered two distinct groups: younger-old individuals (65–74 years), representing the initial phase of old age, and older-old individuals (≥75–85 years), representing advanced old age. This classification is commonly used in studies investigating functional changes associated with aging in older adults (Chung et al, 2023).

As shown in Table 3, NDHGS was significantly higher ($p < 0.001$) in participants aged < 75 years (29.74 ± 15.20 kg) compared with those aged ≥75 years. Regarding loneliness, participants older than 75 years had statistically higher values, with a significant difference ($p < 0.001$) compared with younger participants. However, Cohen's *d* values revealed a small effect size for both NDHGS ($d = 0.39$) and loneliness levels ($d = -0.32$), indicating that while these differences are statistically robust, their practical magnitude is modest.

Table 3 – Handgrip strength and loneliness values in older women and men, stratified by age

Age	N (%)	NDHGS (kg)	Loneliness score
< 75 years	21 (63,6%)	29,74 ± 15,20	35,52 ± 11,30
≥75 years	12 (36,4%)	24,04 ± 13,39	38,83 ± 8,75
<i>p</i>		<0,001	<0,001

According to NDHGS reference values for Portuguese individuals (Mendes et al., 2017), the sample shows a distribution of HGS values across age groups, as illustrated in Table 4. In both groups, most participants had values at or above the mean. Notably, in the group aged < 75 years, almost half of the sample (45.4%) was above the mean.

Table 4 – Cross-tabulation between age and NDHGS normative value

Age	Below average	Average	Above average	Total
<75 years	4 (18,2%)	8 (36,4%)	10 (45,4%)	22
≥75 years	3 (27,3%)	6 (54,5%)	2 (18,2%)	11
Total	7	14	12	33

In addition to handgrip assessment, this study aims to analyse the relationship between NDHGS and the level of loneliness. Spearman correlation coefficients were calculated for the total sample and for the two age-defined groups. As shown in Table 5, a negative correlation was found between NDHGS and loneliness in the total sample ($r = -0.178$), in the younger group ($r = -0.11$) and in the older group ($r = -0.011$). However, these results indicate only a trend whereby higher NDHGS is associated with lower loneliness. As they lacked statistical significance, it is not possible to state that there is a correlation between these two variables.

Table 5 – Correlation between NDHGS and Loneliness

NDHGS/Loneliness	Total sample	<75 years	≥75 years
Correlation coefficient (r)	- 0,178	-0,110	-0,011
p-value (two-tailed)	0,322	0,635	0,974

DISCUSSION

This study aimed to assess handgrip strength (HGS) and relate it to loneliness levels in older adults. The results show that HGS decreases with age, which is in line with other studies. Mendes et al. (2017) found that, for both men and women, within the same height interval, non-dominant handgrip strength (NDHGS) decreases with advancing age. Kim et al. (2018) also observed that HGS values decrease with age in both sexes. The results of the present study indicate that women have higher NDHGS than men. Considering age and height, and the NDHGS reference values established for the Portuguese population (Mendes et al., 2017), men show lower NDHGS values for the same age group and height range, whereas women show higher values. Thus, the HGS assessment results contradict the observation that men, even older men, on average have higher NDHGS than younger women (Mendes et al., 2017). Researchers such as Ramírez-Vélez et al. (2019) put in evidence higher NDHGS among men than among women (26.7 ± 8.5 and 16.7 ± 5.7 kg, respectively, across all ages). In the same direction, Malhotra et al. (2016) reported that HGS among community-dwelling older adults is higher in men (dominant: 28.5 ± 6.7 kg; non-dominant: 26.5 ± 6.5 kg) than in women (dominant: 16.5 ± 4.5 kg; non-dominant: 15.2 ± 4.3 kg). The results of the present study may be explained by the small number of men in the sample (18.2%), compared with other studies that had a more balanced distribution between men and women (41.5% men in Ramírez-Vélez et al. (2019), 45.6% in Kim et al. (2018), 44.4% in Malhotra et al. (2016), and 42% in Mendes et al. (2017)). On the other hand, given that the present study was carried out with older adults who engage in activities in community institutions that support ageing (such as Senior Universities), it is possible - an idea also advanced in other studies (Kim & Park, 2023; Yu et al., 2020) - that women present better functional status measured by NDHGS because they participate earlier and more frequently in activities promoted by such institutions, being more stimulated and thereby delaying normative losses associated with the ageing process.

To examine the correlation between HGS and loneliness levels was the central objective of this study. The results show that there is no statistically significant correlation between HGS and loneliness. However, a trend has been observed whereby HGS tends to decrease as the experience of loneliness increases. The literature on this hypothetical relationship is limited. HGS is more often associated with other factors indirectly related to loneliness, such as increased depressive symptoms or reduced functional independence (Muhammad & Maurya, 2022; Zhang et al., 2023; Gopinath et al., 2017; Zasadzka et al., 2021; López-Bueno et al., 2022). However, regarding chronic loneliness, Kim e Park (2023) highlights its impact on physical health and, particularly, on HGS. Thus, chronic loneliness is associated with a continuous decline in HGS in older adults. This relationship underscores the broader implications of loneliness for physical health and highlights the need for interventions targeting loneliness to potentially mitigate its adverse effects on physical strength and overall well-being. Here, sex is a key issue. The decline is more evident in men, who experience a continued decrease over time, whereas women show a significant decline only in the early phases of exposure to loneliness. The study by Vingeliene et al. (2023) also points to a decrease in HGS with increasing loneliness among men over

80 years of age, while in women the correlation between these two variables is not significant. In contrast, in the study by Yu et al. (2020), loneliness had a significant impact on reducing HGS in women. Taekema et al. (2010) argued that a decrease in HGS led to accelerated dependency in performing activities of daily living but did not allow prediction of increased loneliness. The authors emphasise the role of cultural disparities and socioeconomic contexts in the relationship between HGS and loneliness. In sum, although the literature tends to associate loneliness with lower HGS, recent studies show that this relationship is not linear and may be moderated by other variables, which is why uncertainty persists regarding the relationship between HGS and loneliness among older adults. Giné-Garriga et al. (2021) did not find a relationship between loneliness and reduced grip strength, based on a 2-year longitudinal population-based cohort study with older adults from 10 European countries. Lee et al. (2023) also did not find an association between social isolation and changes in grip strength over three years.

CONCLUSIONS

No statistically significant correlation was observed between loneliness and on-dominant handgrip strength (NDHGS) in older adults. Although previous studies have reported a tendency towards this association, uncertainty remains regarding the nature of the relationship between loneliness and handgrip strength, which reinforces the need for further research with larger samples and the inclusion of other health determinants (such as social status, living conditions, educational level, cognitive performance, body mass index, upper-arm muscle circumference, nutritional status, and physical activity, among other) in order to achieve a broader understanding of this complex relationship. Sex-related differences have been examined in recent studies (e.g., Kim & Park, 2023), as community-dwelling older women appear to be more resilient to feelings of loneliness and to loss of functionality as measured by handgrip strength, responding more proactively to loneliness when compared with men (which may protect them from potential functional losses). Future studies are therefore recommended in which the relationship between handgrip strength and loneliness is analysed while taking sex differences into account.

Although this study did not establish a statistically significant correlation between loneliness and handgrip strength, this measure remains a practical and effective tool for identifying older adults at risk of physical decline and is useful in physiotherapy practice to detect situations of risk of disability, which may lead to loneliness.

LIMITATIONS

The main limitation of this study relates to the sample size ($N = 33$) and the imbalance between the number of male and female participants. These two factors make it impossible to generalise the results. The gender imbalance and the comparatively older age of the male subgroup may have influenced the findings, thus, the results must therefore be interpreted in light of this limitation.

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