COMPARATIVE ANALYSIS
OF THE INFLUENCE OF HANDGRIP STRENGTH
AND MOBILITY ON THE QUALITY
OF LIFE OF INSTITUTIONALIZED ELDERLY

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abstract

The objective of this study was to carry out a comparative analysis between handgrip strength and mobility in the quality of life (QOL) of older adults living in long-term care facilities. Methods: This was a cross sectional study conducted in Belo Horizonte, Brazil, comprised of a sample population of 127 older adults. Measurements included the World Health Organization Quality of Life-OLD (WHOQOL-BREF) questionnaire, assessment of the handgrip strength by hand dynamometer and mobility by Timed Up and Go (TUG). An analysis of variance (ANOVA) was performed to compare the mean values of the WHOQOL-BREF, global and domains, in each stratum of the handgrip strength and mobility values. Our results showed that handgrip dynamometer strength was associated with higher perception of the global WHOQOL-BREF score and two WHOQOL-BREF domains environment (p<0.028) and physical health (p<0.002), that is, the highest QOL values were seen in those older adults with greater handgrip strength. However, no significant association between TUG score and any quality of life domains was found. It can be inferred that handgrip strength seems to influence the quality of life of institutionalized older adults and healthcare providers in LTCs should account for when designing interventions.

keywords

1 Introduction

The population of Brazil is ageing at a rapid pace due to the factors of a falling birth rate and a climbing life expectancy. The older adult population increased 40.3% just between the years 2002 and 2012, while estimates project the ratio of older adults to young people to increase from 39/100 in the year 2010 to 153/100 in the year 2040 (MIRANDA et al., 2016; NETUVELI; BLANE, 2008; VITORINO; PASKULIN; VIANNA, 2012). Compounded by the increased risk of institutionalization associated with advanced age, the population of older adults residing in Long-Term Care facilities (LTCs) will inevitably skyrocket in the coming years (HAIDER et al., 2016; VITORINO; PASKULIN; VIANNA, 2013; MIRANDA et al., 2016). Research has shown particular attention
should be paid to the Quality of Life (QoL) of older adults residing in Long-term care facilities due to negative health outcomes associated with their institutionalization and generally advanced age compared to Older adults in the community (SOUZA-KOCK; BISETTO, 2017; NETUVELI; BLANE, 2008; TAVARES; DIAS, 2012).

Quality of Life (QoL) describes a person’s overall sense of well-being through the combined analysis of objective and subjective dimensions across psychological, social, and physical domains (FLECK; CHACHAMOVICH; TRENTINI, 2006; NETUVELI; BLANE, 2008). The inherent multidimensional quality of the QoL measurement reveals the holistic nature of its impacts on well-being across the lifespan. A factor which affects one dimension of QoL can also affect others (FLECK; CHACHAMOVICH; TRENTINI, 2006; VITORINO; PASKULIN; VIANNA, 2012). Advanced age is associated with a host of negative physical, psychological, and social factors of the QoL, such as increased dependence due to frailty, social isolation, and decreased cognitive functioning, all of which increase the likelihood of institutionalization in LTCs later in life (RODRIGUES; MOLNAR; ABREU, 2016; TAVARES; DIAS, 2012). This has served to emphasize the need for elder care providers to identify efficient and efficacious means of ameliorating the negative factors of QoL related to health status in LTC residents through interventions that address functional incapacities (LACERDA et al., 2017; LUCA et al., 2011; VITORINO; PASKULIN; VIANNA, 2012; TAVARES; DIAS, 2012; WHO, 1996).

Functional capacity, generally defined as the ability to complete Activities of Daily Living, in Older adults has been proven to have a significant, negative correlation with health status (PAULA et al., 2014; TAVARES; DIAS, 2012). Mobility is one determinant of functional capacity; the inability to ambulate safely can lead to a loss of independence and reliance on others for aid to prevent falls, which has been shown to be a negative factor of Quality of Life (FABER et al., 2017; TAVARES; DIAS, 2012). Factors related to this effect are of particular concern for older adults residing in LTCs, as some research has shown they exhibit lower levels of total independence and greater rates of frailty than their peers residing in the community (SOUZA-KOCK; BISETTO, 2017; RODRIGUES; MOLNAR; ABREU, 2016). That said, this effect is not necessarily universal; a study by Cucato et al. (2016) found no significant difference between the functional performance of institutionalized and community older adults.

Despite the incipient demographic shift of older adults, there is a dearth of information regarding the QoL of older adults residing in LTCs overall, let alone the disparities between types of LTCs (LACERDA et al., 2017; MIRANDA et al., 2016; VITORINO; PASKULIN; VIANNA, 2012). The nascent challenge
necessitates the identification of potential physical influences on dimensions of QoL to improve the applicability and effectiveness of treatments in addressing overall wellbeing for older adults residing in LTCs (LACERDA et al., 2017; LUCA et al., 2011; SOUZA-KOCK; BISSETTO, 2017; RODRIGUES; MOLNAR; ABREU, 2016; TAVARES; DIAS, 2012; TOMICKI et al., 2016). Due to their relevance with frailty in older adults, measures concerning strength and risk of falls offer a potentially significant insight for the selection of efficacious avenues of treatment with multidimensional outcomes (HAIDER et al., 2016; TOMICKI et al., 2016).

2 Purpose

Thus, the primary objective of the present study was to carry out a comparative analysis between handgrip strength and mobility in the quality of life of the Brazilian elderlies that reside in long term care facilities.

3 Methods

This cross-sectional study was part of a comprehensive project that evaluated 156 public long-term care facilities located in 34 municipalities of the Metropolitan Region of Belo Horizonte, in the State of Minas Gerais, in 2017 (LACERDA et al., 2017). Sampling and recruitment were based on the lottery system, which considered the universe of institutionalized older adults who lived in long-term care facilities by the time of our data collection. Exclusion criteria for this study was limited to initial refusal of participation and a demonstration of cognitive deficiencies assessed by the Mental State Mini Exam that was administered to those selected by the lottery to avoid cognitive deficiencies acting as a confounder (BRUCKI et al., 2013). In situations of not reaching the minimum score of the Mental State Mini Exam, another individual was recruited until surpassed the required sample. The parameters utilized for sample calculation were prevalence of 58% of the Quality of Life domain, considering an estimation error of 10% and confidence level of 90%, totaling 119 participants, chosen by lot. The study was approved by Research Ethics Committee of PUC Minas, number 31471114.4.0000.5137).
3.1 Measurements

3.1.1 Quality of Life (QoL)

A dual administration of the Brazilian World Health Organization Quality of Life-BREF [WHOQOL-BREF] was used to assess QoL. Designed for international application and tested in Brazil during its development, the WHOQOL-BREF has shown consistent validity for all domains (FLECK; CHACHAMOVICH; TRENTINI, 2006; WHO, 1996). The WHOQOL-BREF is a 26 questions survey of QoL based on four domains: Physical Health, Psychological Health, Social Relationships, and Environment, is a condensed version of the full WHOQOL-100 questionnaire (FLECK; CHACHAMOVICH; TRENTINI, 2006). A high score in total and each subscale reflects a good QoL, while a low score indicates a poor QoL. In order to validate this instrument for the Brazilian population, it was applied in a sample of 424 elderly people in the city of Porto Alegre-RS, in the year of 2005. (FLECK; CHACHAMOVICH; TRENTINI, 2006). The instrument showed satisfactory characteristics of internal consistency (Cronbach coefficients of 0.71 to 0.88), discriminant validity (p <0.01), concurrent validity (correlation coefficients between -0.61 and -0.50) and test-retest reliability (correlation coefficients between 0.58 to 0.82).

3.1.2 Handgrip Strength

Dynamometer-assessed Handgrip Strength (HS) is a measurement of manual gripping force which has demonstrated good reproducibility and excellent inter-rater reliability (ROBERTS et al., 2011). The test utilized a dynamometer (JAMAR, Hatfield, PA, USA) for measurement of HS, which were calibrated at the onset of the data collection phase. Overseen and verbally instructed by a researcher, the test was performed three times by each hand while the participant was in a seated position, their arm laid at natural adduction and elbow bent to 90°. The dynamometer scores were measured in kilograms/force (kg/force).

3.1.3 Mobility

The timed-up-and-go test [TUG] was utilized to assess and quantify the basic functional mobility of the participants (PODSIADLO; RICHARDSON, 1991). A standard TUG test which measured the amount of time it took for a
participant to transfer from a seated to a standing position, walk three meters forward, turn around and return to a seated position. Participants were permitted to utilize any assistive instrument they required and test administrators provided verbal cues when necessary, although no physical assistance from another person was permitted.

3.2 Statistical analysis

A descriptive analysis of the data was performed, calculating frequencies and proportions for categorical variables and mean, median and standard deviations for continuous variables. ANOVA were used to compare the means of the quality of life according to handgrip strength and mobility of the older adults. The analyses were performed in STATA software (Stata Corporation, College Station, Texas) version 12.0., considering a level of significance of 5%.

3 Results

A total of 127 Brazilian elders participated in our study, however, only 114 residing in long term care facilities; completed the dynamometer test and 70 participants completed the TUG test. Table 1 presents the distribution of demographic and measured variables for the sample population.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Frequency of no. of cases and percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>60 to 69</td>
<td>41 (32,3)</td>
</tr>
<tr>
<td>70 to 79</td>
<td>47 (37)</td>
</tr>
<tr>
<td>80 to 89</td>
<td>31 (24,4)</td>
</tr>
<tr>
<td>Over 90</td>
<td>8 (6,3)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>55 (43,3)</td>
</tr>
<tr>
<td>Married</td>
<td>21 (16,5)</td>
</tr>
<tr>
<td>Widower</td>
<td>27 (21,3)</td>
</tr>
<tr>
<td>Divorced</td>
<td>24 (18,9)</td>
</tr>
</tbody>
</table>
To account for the large variance in HS and TUG scores, participants were scaled in percentiles and the results of the analysis of variance can be seen in Table 2. Greater handgrip strength was significantly associated with a higher score on the Physical Health ($p = 0.002$) and Environment ($p = 0.028$) domains, as well as the global WHOQOL-BREF score ($p = 0.007$). This result implies that the overall relationship with the global WHOQOL-BREF score by handgrip strength is due to significant differences in only a few domains. Additionally, the Social Participation ($p = 0.058$) and Past, Present, & Future Activities ($p = 0.065$) domains of the WHOQOL-OLD neared significance, but did not meet the threshold. To account for the large variance in TUG scores, participants were scaled in quartiles based on time to complete the TUG and compared their scores on the WHOQOL surveys. The results of the TUG demonstrated no correlations with any domain of either WHOQOL survey even approaching significance (Table 2).
Table 2 – Means WHOQOL-BREF according to TUG and Handgrip Strength.

<table>
<thead>
<tr>
<th>WHOQOL-BREF</th>
<th>TUG – Mean (±SD)</th>
<th>Handgrip Strength – Mean (±SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domain</td>
<td>&lt; 25%</td>
<td>25% to 50%</td>
</tr>
<tr>
<td>Physical Health</td>
<td>70.1 (19.9)</td>
<td>67.0 (17.1)</td>
</tr>
<tr>
<td>Psychological</td>
<td>69.1 (19.9)</td>
<td>65.2 (17.9)</td>
</tr>
<tr>
<td>Social</td>
<td>73.7 (18.7)</td>
<td>66.7 (16.9)</td>
</tr>
<tr>
<td>Environment</td>
<td>67.8 (18.3)</td>
<td>60.8 (17.1)</td>
</tr>
<tr>
<td>Global</td>
<td>70.2 (15.3)</td>
<td>64.9 (12.9)</td>
</tr>
</tbody>
</table>

Source: Author’s data.
* Correlation is significant at the 0.05 level.

4 Discussion

This examination showed mixed results regarding the original hypothesis of significant associations amongst domains of Quality of Life with mobility and handgrip strength, measured by TUG and dynamometer, in a sample of older adults residing in long-term care among the investigated population. The primary findings of this study demonstrate: (i) greater HS scores were significantly associated with increased global WHOQOL-BREF scores and two of its domains, Physical Health and Environment; and (ii) no relationship between the TUG times and any measured domain of QoL in the sample population.

With respect to the distribution of measured variables of the sample, it was unusual to enroll a greater number of males; a reflection of the social, psychological and health-related gender differences in the aging process, studies of older adults typically enroll more females (CUCATO et al., 2016; LACERDA et al., 2017; MUSALEK; KIRCHENGAST, 2017; TOMICKI et al.,
The non-significance of the TUG with either WHOQOL survey runs contrary to the hypothesized results; considering mobility is a determining facet of the Physical Health domain (WHO, 1996), it was expected that this domain would represent the strongest association with TUG times. Some explanatory theories were developed to address this discrepancy with the hypothesis. First, mobility limitations have been shown to increase the level of dependence (SOUZA-KOCK; BISSETTO, 2017), likelihood of institutionalization (WEBBER et al., 2010), and negatively influence the QoL of Brazilian older adults (PAULA et al., 2014). However, in this study, it was not possible to achieve the desired size in the sample calculation. In addition, the mean completion time for the TUG (29.10 secs; SD=40.7) was inflated and highly variable relative to the mean score (19.25 secs; SD=8.52) of another, small sample (n=10) of institutionalized older adults (LEÃO et al., 2017). Thus, the observed non-significance with QoL may be attributed to the noteworthy variance in the TUG times. This rationalization is further evidenced by previous studies of older adults in various settings that have established a significant correlation between HS and TUG times (BRITO et al., 2015), which was not corroborated by the present results.

One of three determinants for frailty in older adults (ROBERTS et al., 2011), HS is indicative of upper-body and overall muscle strength. Declines in muscle strength have been shown to result in declines in QoL, a particular area of concern for institutionalized older adults due to age-related muscle loss known as sarcopenia (LACOURT; MARINI, 2006). In contrast to TUG, the significance of HS with some WHOQOL domains fulfilled the original hypothesis. The significant associations with the Physical Health and Environment domains indicate that the relationship between muscle strength on the QoL are largely defined by the ability of residents to maintain a degree of control over their surrounding environment following institutionalization. This was partially supported by the literature; a sample of community-dwelling older adults in Austria found that HS was only significantly related with the global WHOQOL score ($\beta=0.292$; p-value=0.017), although the Physical Health ($\beta=-0.077$; p-value=0.540) and Environment ($\beta=0.026$; p-value=0.836) did not (HAIDER et al., 2016).

The applicability of the present study for eldercare providers and administrators are primarily based on the result that muscular strength declines are associated with reduced QoL (LACERDA et al., 2017; RIZZOLI et al., 2013). Although physical activity does improve QoL for institutionalized older adults (VITORINO; PASKULIN; VIANNA, 2012), it is important to also incorporate
programs which address the environmental determinants modifiable by strength (CUCATO et al., 2016; LACERDA et al., 2017). According to Cucato et al. (2016), a comprehensive rehabilitation program which incorporates health and social support through engaging stimulus was the impetus for the comparable HS and TUG performance between institutionalized and community-dwelling older adults in Brazil. Alves-Silva et al. (2013) stress the importance of these tasks creating a sense of purpose and productivity to counter the negative psychological impacts associated with institutionalization.

The main limitations of this study are borne out of size sample cue that was not achieved for assessment of mobility. Additionally, the exclusion of participants who demonstrated cognitive deficiencies and big TUG score variance may have caused the results to not accurately reflect mobility. Finally, its cross-sectional design and the small sample do not allow for the determination of causality amongst significantly associated results. Replication and examination in a longitudinal design to establish causality between HS and Quality of Life may offer potentially beneficial avenues to strengthen the validity of these results.

5 Conclusions

Our results showed no significant difference in quality of life domains between TUG score. However, the Physical and Environmental domains of quality of life were greater in the older adults with better grip strength levels. We concluded that strength appears to have a positive impact on some determinants of quality of life in the investigated population, which healthcare providers in long-term care should account for when designing interventions to this particular population.

ANÁLISE COMPARATIVA DA INFLUÊNCIA DA FORÇA E MOBILIDADE DA PREENSÃO MANUAL NA QUALIDADE DE VIDA DE IDOSOS INSTITUCIONALIZADOS

resumo

O objetivo desse estudo foi realizar uma análise comparativa entre a força de preensão manual e a mobilidade na qualidade de vida de idosos residentes em Instituições de longa permanência. Este foi um estudo transversal conduzido no município de Belo Hori-
zonte, Brasil, envolvendo uma amostra de 127 idosos institucionalizados. As medidas incluíram os questionários de Qualidade de Vida propostos pela Organização Mundial de Saúde (WHOQOL-BREF), avaliação da força de preensão manual pelo dinamômetro manual e a mobilidade pelo Timed Up and Go (TUG). Foi realizada uma análise de variância (ANOVA) para comparar os valores médios do WHOQOL BREF, total e por domínio, em cada estrato dos valores da força de preensão manual e de mobilidade. Os resultados mostraram que foram observados diferenças significativas nos escore global do WHOQOL BREF e nos domínios meio ambiente (p<0.028) e físico (p<0.002) entre os estratos da força de preensão manual, ou seja, os maiores valores da QV foram vistos naqueles idosos com maior força de preensão. Por outro lado, não houve diferença nas médias do WHOQOL, total e por domínio, em nenhum dos estratos do TUG. Pode-se inferir que a força de preensão parece influenciar na qualidade de vida em idosos institucionalizados, devendo, pois, aos gestores das instituições de longa permanência levar em consideração essa informação ao propor intervenções para essa população.

palavras-chave
Dinamômetro de força muscular. Qualidade de vida. Idoso. Lar para idosos.

references


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