Intra and inter-rater reliability of algometry to measure pain threshold in institutionalized elderly

Confiabilidade intra e interexaminador da algometria para mensurar o limiar da dor em idosos institucionalizados

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ABSTRACT | INTRODUCTION: Pain becomes an important factor when studying the elderly population, as it has a great impact on daily activities, increasing comorbidities and mortality, becoming a serious public health problem. **OBJECTIVES:** To evaluate the reliability of the intra-examiner and inter-examiner measurements of a digital algometer in measuring the hip pain threshold of institutionalized and fragile elderly people. **MATERIALS AND METHODS:** The sample was intentionally in accordance with the elderly's cognitive ability to respond to assessments; two examiners performed algometry in the hip region on 17 elderly residents of a long-term institution. **RESULTS:** The intraclass correlation coefficients (ICC) demonstrated high reliability of the intra-examiner instrument - equal to 0.877 and very high inter-examiner - equal to 0.973. **CONCLUSION:** There is reliability in the digital algometer in measuring the hip pain threshold in the elderly in a long-term institution.

KEYWORDS: Reliability. Algometry. Pain. Aged.

RESUMO | INTRODUÇÃO: A dor passa ser um fator importante quando se estuda a população idosa, pois apresenta um grande impacto nas atividades diárias, aumentando as comorbidades e a mortalidade, transformando-se em um sério problema de saúde pública. **OBJETIVOS:** Avaliar a confiabilidade das medidas intraexaminador e interexaminador de um algômetro digital em mensurar o limiar da dor no quadril de idosos institucionalizados e frágeis. **MATERIAIS E MÉTODOS:** A amostra foi de forma intencional de acordo com a capacidade cognitiva dos idosos para responderem às avaliações; dois examinadores realizaram a algometria na região do quadril em 17 idosos residentes de uma instituição de longa permanência. **RESULTADOS:** Os coeficientes de correlação intraclasse (CCI) demonstraram alta confiabilidade do instrumento intra-examinador - iguais a 0,877 e muito alta interexaminador - iguais a 0,973. **CONCLUSÃO:** Há confiabilidade no algômetro digital em mensurar o limiar de dor no quadril em idosos de uma instituição de longa permanência.

PALAVRAS-CHAVE: Confiabilidade. Algometria. Dor. Idosos.

Introduction

The Brazilian population is facing an accelerated aging process related entirely to three factors, such as: a decrease in the fertility rate, which went from 6.28 children per woman in 1960 to 1.90 children in 2010; an increase in life expectancy, that reached 73.4 years old; and a reduction in the mortality rate[1]. Currently, data from the World Health Organization - WHO (2018) suggest that the proportion of the world population over 60 years old will double from 12% to 22%, between 2015 and 2050[2]. According to the Brazilian Institute of Geography and Statistics (IBGE), by 2060, the percentage of people over 65 years old will rise from the current 9.2% to 25.5%. Thus, 1 in each 4 Brazilians will be elderly[3]. Therefore, the demand for institutions for full-time care and monitoring of the elderly has been growing, with the commitment to supply their basic needs and the need to have better knowledge regarding this population[4].

Asylum institutions have a duty to guarantee the well-being of the elderly in order to promote their dignity and social insertion. They must also consider the specific characteristics of aging, ensuring dignified aging[5].

Pain becomes an important factor when studying the elderly population, as it has a great impact on daily activities, increasing comorbidities and mortality. Moreover, it becomes a serious public health problem that needs to be diagnosed, measured, evaluated and treated in order to reduce morbidity and improve quality of life[6]. Studies show that 50% of elderly people report pain as the main complaint[7]. This is one of the factors that most interferes with their quality of life and the repercussions have been associated with depression, disability and mortality[8].

Pain is considered a multidimensional experience, being described in terms of tissue, real or potential injuries. Pain is subjective, each individual learns to express and deal with their pain from their previous experiences. Chronic pain is defined as pain that persists beyond a reasonable time to heal an injury[9].

Pain resulting from proximal femur fracture is the most common type in older people[10], increasing over the years. This can be explained due to the higher prevalence of osteoporosis and the increased number of falls associated with the problem[11], resulting in pain in the post-fall[12].

Pain experience is common for people aged 65 years old and more. Around 85% of people in this age group will have a health problem associated with pain. Pain affects between 32% to 34% of the elderly people and is characterized as occasional in 20% to 25%; acute in 6% to 7% and chronic between 48% to 55% of the elderly people[13].

It is widely argued that pain assessment is subjective, but there is a lack of an instrument that can indeed quantify the pain that the elderly person reports. Therefore, there is a need to validate an instrument that can quantify pain among the elderly. The measurement of this pain can influence health care decisions for this population[14].

It is intended to evaluate the reliability of the intra-examiner and inter-examiner measurements of the Instrutherm DD-200® algometer in quantifying the pain of elderly residents in a long-term care institution.

Methods

This is an exploratory observational study, approved by the Research Ethics Committee of the City University of São Paulo (UNICID) registration number: 096365/2015 (CAAE 49467215.2.0000.0064). Data collection was carried out during the months of July and August 2015.

For the sociodemographic characterization of the elderly people, a semi-structured questionnaire was applied to obtain the following information: gender, age group, education level, place of birth, monthly income, housing situation and self-reported diseases.

The research was conducted in a long-term care institution in the city of greater Vitória, where those responsible for it signed the informed consent form (ICF). Seventeen elderly people who participated in the study were able to actively respond to the initial assessment and to understand how algometry measurements would be processed.

The sample was made intentionally and according to the intellectual capacity and availability of the elderly to participate in the study.

Two examiners, students of the undergraduate Physiotherapy course at UFES, underwent previous algometry training for a period of approximately one week.

In this study, the elderly needed preserved cognitive skills so that they could participate actively in the assessment. Cognitive performance was assessed using the Mini Mental State Examination (MMSE): it is a questionnaire for tracking and assessing cognitive function, composed of domains of: spatial orientation; temporal orientation; immediate memory and evocation; calculation; naming language; repetition, comprehension, writing and drawing copy. The cutoff points are 20 points for illiterates; 21 points for individuals with one to three years of schooling; 24 points for four to seven years of schooling and 26 points for eight years of schooling or more[15].

The Geriatric Depression Scale (GDS) was also applied: it is an instrument used to detect a diagnosis of depression in adults and the elderly. It consists of 15 negative / affirmative questions in which the result totals 5 or more points, in which a score equal to or greater than 5 characterizes severe depression[16].

The Functional Comorbidity Index (ICF) was used: it is a questionnaire that contemplates multidimensional aspects of the health condition of the elderly, consisting of 20 questions distributed in eight sections. At the end, the Body Mass Index (BMI) is also calculated. The cutoff points are 1 point for each self-reported disease on the presence or absence of this comorbidity, totaling 18 points, and the higher the number of points the higher the individual's functional comorbidity vulnerability index[17].

Physical-functional performance was evaluated using the Short Physical Performace Battery (SPPB): it is an instrument with tests that assess physical-functional performance by means of balance time, gait speed and strength in the lower limbs. First, the individual is asked to stand with their feet together looking ahead, if he is able to remain in the position for 10 seconds, 1 point will be awarded; otherwise or if he refuses to do so, no points will be awarded. In the second test, the individual must remain in the Semi Tandem position, which has the same score as the previous one; the person is asked to stay in the Tandem position, one foot in front of the other; if he is able to stay in position for 10 seconds, 2 points will be awarded; if he remains in the position, between 3 to 9.99 seconds, 1 point will be awarded and, for a time less than 3 seconds, no point will be awarded. Thus, the total value of the balance test will be given by the sum of the three positions, with a maximum score of 4 points. The gait speed is observed when asking the individual to walk, with his usual step, a distance of 4 meters. The round-trip walking times will be timed, the shortest walking time will be valid. The maximum score will be 4 points, in which points will be awarded as follows: walking time less than 4.82 seconds - 4 points; between 4.82 and 6.20 seconds - 3 points; between 6.21 and 8.70 - 2 points; greater than 8.70 - 1 point. If the individual assessed does not walk, no points will be awarded. The lower limb strength test is performed by sitting and rising from the chair five times in a row without using the upper limbs; the maximum score will be 4 points for a test time of 11.19 seconds or less; 3 points awarded for a test time of 11.20 to 13.69 seconds; 2 points for a test time of 13.70 to 16.69 seconds and 1 point for 16.70 seconds or more. The final total score of the SPPB ranges from 0 to 11; the lower the score, the greater the physical-functional impairment[18].

Algometry was performed on the hip[19]. It was used to assess the pain threshold (hyperalgesia) in six points located 2-3 cm from the surgical incision on three levels (upper, middle and lower), using a portable algometer (reversible digital dynamometer DD500, brand Instrutherm®) with a 0.28 cm2 area probe. The pain threshold was identified by applying pressure in each region in a progressive manner and was interrupted when the elderly person manifested perceiving the pain stimulus. Participants were instructed to verbalize when they perceived the first unpleasant sensation of pain (painful perception). The evaluator used an angle of approximation of 90 degrees, formed between the stimulation surface and the stimulated point, with constant speed. The elderly person was evaluated in the most comfortable position possible, sitting or lying down. When in the lying position (most of the elderly), the participant remained in the lateral decubitus position on the contralateral hemibody to the surgery, as shown in figure 1.

Figure 1. Six points demarcated on the hip surgery line. Source: own, 2015
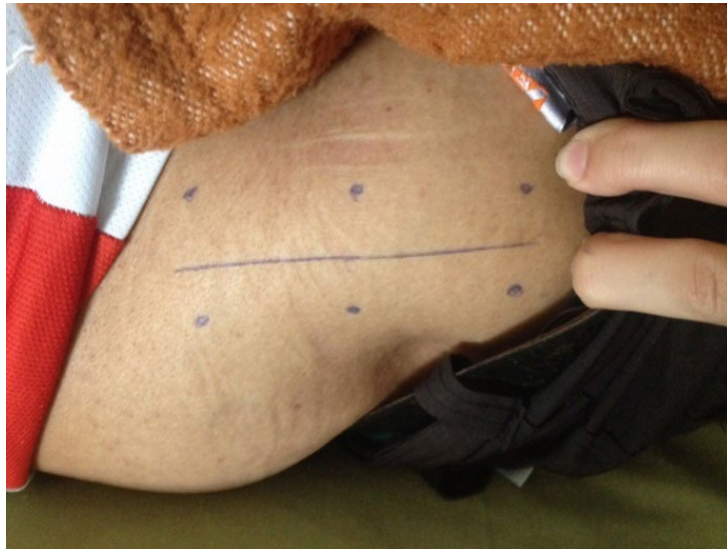
A familiarization was made with the equipment in the participant's hand or forearm before the beginning of each collection. As soon as the pain was perceived by the participant, the needle of the algometer was paralyzed. Three attempts were made with an interval of 60 seconds. The average of these attempts was computed for each area[19]. Finally, the elderly person was asked: "Do you feel pain anywhere in your body?".

For descriptive analysis of the data, the Statistical Package for the Social Science (SPSS) program version 20.0 was used, and the intraclass correlation coefficient (ICC) 1.1[20] was applied to collect continuous data for related samples, both for inter and intra-examiner analysis. Weak correlation was considered when the value found was less than 0.4; satisfactory correlation with a value greater than or equal to 0.4 and less than 0.75. When the value found was greater than or equal to 0.75, the correlation was considered excellent[21].

Results

The data obtained were divided into four tables: Table 1 shows the sociodemographic data of the elderly; Table 2 shows hip algometry; table 3 shows the intra-examiner algometry; and table 4 shows the inter-examiners.

When questioned, through the Pain Inventory, if they had other body aches, 41%[7] said they felt pain in the lower limbs, 24%[4] reported pain in the upper limbs and 35%[6] said they did not feel any pain. The elderly were asked about whether, in the last week, they had felt any pain: 70%[12] answered no and 30%[5] said yes.

Regarding the use of medication that the elderly take for pain, 53%[9] said they did not use any pain medication, 41%[7] did not know how to answer and 6%[1] said they did.

When researching the number of falls through the History of Falls, it was found that these elderly people had at least one fall in the last month 70%[12], 24%[4] had two falls and only 6%[1] reported no fall in the last month.

When investigating the incidence of depression among the elderly, through the Geriatric Depression Scale, it was found that 9 elderly individuals (52.94%) were classified as depressive and 8 elderly individuals (47.06%) were classified as normal.

The elderly in this study have a BMI (body mass index) within the average of 27.4. The other sociodemographic and health data are shown in table 1:

Table 1. Sociodemographic data of elderly who participated in the study (n = 17)

Variables	Values (n) (%)
Age (Mean)	± 73.7
Age (70 to 89 years old)	11 (64.7)
Women	10 (58.8)
Use of 3 to 5 medications	12 (70.6)
Does not use walking aid	12 (70.6)
Subjective perception of good to regular vision	15 (88.3)
Subjective perception of good to regular hearing	11 (64.7)
BMI	
Obesity	8 (47.0)
Normal weight	5 (29.4)
Health conditions	
Urinary incontinence (present)	9 (52.9)
Sleeping problems (present)	4 (35.3)
ICF	
Osteoarthritis and Osteoarthosis (present)	7 (41.2)
Depression (present)	6 (35.3)
MEEM	
Scored > 22 to 25 (1 to 4 years of schooling)	10 (58.8)
Scored < 20 (illiterate)	4 (23.5)
GDS	
Have symptoms of depression	9 (52.9)
SPPB	
Scored from 5 to 7 low physical capacity	10 (58.7)
TIME UP GO TEST	
It took up to 2 minutes to perform the test	8 (47.0)
PAIN	
Feel pain	10 (58.8)
Shoulder pain	4 (23.5)
Knee pain	6 (35.3)
Felt pain in the last week	5 (29.4)
Not on medication	12 (70.6)
Fall History	
Fell in the last 12 months	8 (47.1)
Presented pain due to the fall	3 (17.6)

* BMI (Body Mass Index); * ICF (Functional Comorbidity Index); * MEEM (Mini Mental State Examination); * GDS (Geriatric Depression Scale); * SPPB (Short Physical Performance Battery).

Table 2. Algometry average performed intra and inter-evaluator. * First measure intra-rater evaluation; ** Intra-rater evaluation after 1 week; *** Interrater evaluation on the same day as evaluator A

Elderly	Algometry A*	Algometry A**	Algometry B***
1	26.05	28.76	16.1
2	42.72	56.66	43.93
3	27.36	33.9	28.76
4	23,82	50.25	25.24
5	29.28	13.16	25.68
6	20.01	25.95	17.53
7	6.15	6.38	3.51
8	7.91	13.68	5.51
9	8.25	7.87	7.12
10	4.34	7.29	3.86
11	7.36	6.26	5.44
12	4.65	5.82	4.05
13	6.49	8.94	7.52
14	9.46	13.27	7.57
15	23.22	40.79	27.07
16	38.08	47	26.79
17	18.32	4.33	13.67

Table 3. Intra-examiner correlation

	Intra-examiner correlation	ICC 95%
Result	0.877	0.956

Note: Intraclass Correlation Coefficient

Table 4. Inter-examiner correlation

	Inter-examiner correlation	ICC 95%
Result	0.973	0.990

Note: Intraclass Correlation Coefficient

Discussion

The sensitivity of the intra and inter-examiner algometer in measuring and quantifying the pain threshold in elderly residents of two long-term care institutions was measured. The choice is legitimized by the fact that they are more fragile and have greater physical or mental morbidities[22], due to social isolation, physical inactivity and psychological processes. Therefore, it can be inferred that the longer the institutionalization time, the greater the weakness of the elderly[23].

Pain is one of the main consequences of falls in the elderly[24], and in Brazil about 30% of them suffer falls at least once a year[25]. Musculoskeletal disorders, such as osteoarthrosis, result in stiffness and pain in the joints and are linked to instability in balance[26], which can lead to a fall.

The population study SABE, on chronic pain in elderly people in São Paulo, showed for the first time that pain is an important involvement for the elderly, and it can lead to important disabilities in society[27].

Chronic pain has negative impacts on the physical and mental health of the elderly, such as depression, physical disability, functional dependence and social isolation[28], which overloads the health services[13]. Particularly, chronic pain increases the risk of recurrent falls in the elderly[29]. There are few studies on chronic pain in the elderly. This may be due to a myth that the elderly are more sensitive and complaining regarding the pain, and it is seen as a normal characteristic of aging that often cannot and does not need to be treated[30].

The association between pain and cognitive impairment lies in the fact that brain areas involved in the regulatory mechanisms of pain are the same ones involved in decision-making and attention[31]. In addition, most patients with chronic pain also suffer from depression, anxiety, stress or a combination of these factors, directly affecting cognitive functioning through apathy, effects of medication, fatigue and sleep disorders[32].

Chronic pain in the elderly is a frequent health problem encountered by health professionals who deal with the elderly, mainly among the elderly over 65 years old. Chronic pain is associated with functional disability; reduced mobility and day-to-day activities; the risk of falls; depression and anxiety; sleep problems and even social isolation[33].

Pain needs to be assessed beyond a sensory event. It has affective characteristics (which are the emotional responses to the chronic condition), cognitive (which involve attitudes and beliefs about pain), behavioral (which involve the attitudes of the elderly as well as their families and caregivers towards pain) and sensory components (which are connected to the quality, location and mode of this pain)[33].

A study[34] on chronic pain in the elderly found that the dorsal region was the predominant area (48%), followed by the lower limbs (24%), head (8%) and upper limbs (4%). The elderly in this study also presented lower limb pain.

The main treatment for chronic pain has been medication, however, for the elderly, this has not been the best option due to the high cost, side effects and low efficiency of improvement. This promotes the search for physical therapy and psychotherapy[34,35]. However, the majority of elderly complainers of pain in this study do not use any pain medication. When asked about the use of other medications, they reported using antihypertensive, antidepressant, anxiolytics, among others, which may justify the high prevalence of falls in these elderly people. It is known that these drugs decrease alertness, psychomotor function, and they can cause muscle weakness, dizziness, postural hypotension, especially if administered in inappropriate doses [36,37].

Eventually, the elderly assessed showed at least one fall in the last year. These elderly people are more likely to suffer falls when compared to non-institutionalized elderly people, as they have lower levels of strength, balance, flexibility and physical resistance [38].

The elderly in this study were overweight, an important factor for the development of pain and increased risk of falling. A study [39] which aimed to identify the nutritional status according to the body mass index of institutionalized elderly people, found that 66.5% of the sample had an inadequate nutritional status, 45.5% of whom were underweight, 33.5% of normal weight, 7.8% of pre-obesity and 13.2% of obesity[39]. We observed that our data correspond to the literature, since the mean BMI = 27.4 corresponds to overweight [40].

The elderly had depressive symptoms that can worsen the sensation of pain. The prevalence of symptoms of depression detected was lower than that reported among the elderly in the city of Juazeiro do Norte, Ceará, where a prevalence of depression of 65% was verified [41]. However, it was higher than in the elderly in the district of Bragança, which had an incidence of 46.7% [42].

The result obtained for intra-examiners in this study was equal to 0.87, indicating a high reliability of the instrument in assessing the pain threshold in the elderly when performed by the same examiner within one week between measurements.

Regarding the inter-examiner reliability, the result obtained was equal to 0.97, which indicates a very high reliability of the instrument when done by different evaluators.

To have a device that can measure and quantify the pain threshold in the elderly removes the subjective character when assessing pain in the elderly, using scales and questionnaires. For health professionals, measuring the pain threshold can indicate the patient's well-being, serving as a parameter for their evolution and helping in the choice of medication and diagnosis[43].

Conclusion

The Instrutherm DD-200® digital algometer proved to be sensitive in measuring the pain threshold by pressure in the hip region in elderly people residing in a long-term care institution. It is known that the lower in Newtons (same direction, way and strength) the elderly person's sensitivity to the algometer, the greater the pain in the tested area. However, studies with a larger population need to be carried out.

Author contributions

Prestes YA participated in the conception, design and writing of the scientific paper. Souza MS participated in the design and analysis of the data. Pereira MS and Ervati R participated in the conception, design, acquisition and statistical analysis of the research data, interpretation of the results, writing of the scientific paper. Campos HLM participated in the research design, guided in the design and statistical analysis of the research data, guided in the interpretation of results and supervised the writing of the scientific paper.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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