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## **O Equilíbrio e os sintomas de Depressão e Ansiedade nas Pessoas Idosas**

Balance and Anxiety and Depression symptoms in Old Age  
People



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Dissertação apresentada à Universidade de Aveiro para  
cumprimento dos requisitos necessários à obtenção do grau de  
Mestre em Gerontologia no ramo de Especialização em  
Intervenção Comunitária, realizada sob a orientação científica  
da Doutora Alda Marques, Professora Adjunta da Escola  
Superior de Saúde da Universidade de Aveiro

Dedico este trabalho à minha família pelo incansável apoio em todos os momentos da minha vida.

## **O júri**

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## Palavras-chave

Equilíbrio; Pessoas Idosas; Ansiedade; Depressão.

## Resumo

**Enquadramento:** As quedas apresentam uma elevada incidência em pessoas idosas, representando um problema de saúde pública. Estas são a segunda causa de mortes acidentais a nível mundial (1).

A literatura indica que pessoas com maior grau de sintomatologia ansiógena e depressiva tem o equilíbrio mais comprometido, e em pessoas idosas é ainda mais problemático (12). Alguns estudos mostram uma relação entre sintomas de depressão e ansiedade e equilíbrio (18), contudo, pouco se sabe, como apenas a ansiedade afeta o equilíbrio. É também desconhecido qual/quais são os sistemas responsáveis pelo equilíbrio mais afetados/preservados nesta população na ausência ou presença de diferentes níveis de sintomatologia ansiógena ou depressiva.

**Objetivos:** Este estudo teve como objetivos explorar as diferenças no equilíbrio entre pessoas idosas com presença/ausência de sintomas de ansiedade e depressão e como o equilíbrio pode ser afetado/preservado pelos diferentes níveis de ansiedade e depressão na mesma população.

**Métodos:** Foi realizado um estudo transversal quantitativo. O protocolo incluiu recolha de dados sociodemográficos, antropométricos e de clínica geral. A confiança no equilíbrio foi avaliada através da Activities-specific Balance Confidence (ABC), o equilíbrio através do Balance Evaluation System Test (BESTest) e da Berg Balance Scale (BBS). O nível de significância considerado foi de  $p < 0.05$ .

**Resultados:** Participaram neste estudo 136 pessoas idosas com uma média de idades de  $75.9 \pm 8.8$  anos. Todas as secções do BESTest mostraram ser significativamente afetadas quando estão presentes sintomas de ansiedade ou depressão ( $p < 0.001$ ). Resultados semelhantes foram observados na avaliação com a BBS ( $p < 0.001$ ). Contudo, a secção Respostas posturais reativas apresentou uma diferença maior aquando da presença versus ausência ( $49.4 \pm 21.1$  vs  $84.2 \pm 14.9$ ;  $p < 0.001$ ) de sintomas de ansiedade e da presença vs ausência ( $46.3 \pm 30.3$  vs  $88.5 \pm 15.3$ ;  $p < 0.001$ ) de sintomas depressivos. A confiança no equilíbrio (ABC) na presença de sintomas de ansiedade e depressão também diminuiu significativamente em ambos os casos (respetivamente:  $p = 0.010$ ;  $p = 0.001$ ).

A severidade dos sintomas influenciou significativamente o equilíbrio (BBS (ansiedade:  $p = 0.013$ ; depressão:  $p = 0.029$ ) e BESTest ( $0.001 < p < 0.046$ )). No entanto, a confiança no equilíbrio não mostrou ser afetada significativamente pela severidade de ambos os sintomas (ansiedade:  $p = 0.516$ ; depressão:  $p = 0.274$ ).

**Conclusão:** A presença de sintomas ansiógenos ou depressivos, nas pessoas idosas, afeta significativamente o equilíbrio e a auto percepção do equilíbrio. Este estudo demonstrou também que o equilíbrio diminui, significativamente, à medida que a severidade desses sintomas aumenta, mas a auto-percepção do equilíbrio não parece ser afetada.

## Keywords

Balance; Old Age People, Anxiety; Depression.

## Abstract

**Background:** Falls have a high incidence in old age people and it results in severe consequences representing a public health problem. Falls are the second worldwide cause of accidental deaths (1). The literature shows that people with high depression and anxiety symptoms have impaired balance and this is more problematic in old age people (12). Some studies have shown a relationship between depression/anxiety symptoms and balance (18) however little is known how just anxiety symptoms affect balance. It is also unknown which systems responsible for balance are more affected/preserved in this population in the absence or presence of different levels of anxiety and depression symptoms.

**Aim:** The aims of this study were to explore: the balance differences between old age people with presence/absence of anxiety and depression symptoms and how balance may be affected/preserved by the different levels of anxiety and depression symptoms in the same population.

**Methods:** A quantitative cross-sectional study was conducted. The protocol included socio-demographic, anthropometric and general clinical data. Balance confidence was evaluated with the Activities-specific Balance Confidence (ABC), the balance with the Balance Evaluation System Test (BESTest) and with the Berg Balance Scale (BBS). The level of significance considered was set at  $p < 0.05$ .

**Results:** 136 old age people with a mean age of  $75.9 \pm 8.8$  years old, participated in this study. All BESTest sections were significantly affected by the presence of anxiety or depression symptoms ( $p < 0.001$ ). Similar results were observed in BBS ( $p < 0.001$ ). However, the Reactive section presented the larger difference between present or not present ( $49.4 \pm 21.1$  vs  $84.2 \pm 14.9$ ;  $p < 0.001$ ) of anxiety symptoms and present or not present ( $46.3 \pm 30.3$  vs  $88.5 \pm 15.3$ ;  $p < 0.001$ ) depression symptoms. Participants' balance confidence (ABC) was also decrease significantly in both of cases (respectively:  $p = 0.010$ ;  $p = 0.001$ ).

The severity of the symptoms influenced significantly the balance (BBS (anxiety:  $p = 0.013$ ; depression:  $p = 0.029$ ) and BESTest ( $0.001 < p > 0.046$ ). However, balance confidence shows not be significantly affected by the level of both of symptoms (anxiety:  $p = 0.516$ ; depression:  $p = 0.274$ ).

**Conclusion:** The presence of anxiety and depression symptoms significantly decreases balance performance and balance confidence in old age people. Additionally, the severity of symptoms significantly decreases balance performance but do not seem to significantly impact on balance confidence.

**Abbreviations and/or  
acronyms**

ABC - Activities-specific Balance Confidence Scale

BBS – Berg Balance Scale

BESTest – Balance Evaluation System Test

BMI – Body Mass Index

HADS - Hospital Anxiety and Depression Scale

WHO – World Health Organization



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## 1. INTRODUCTION

*Fall* is defined as the moment that a person rest inadvertently on the ground, floor or other level (1).

Falls are the second worldwide cause of accidental deaths and are responsible for 424 000 deaths annually (1). The highest number of fatal falls occur in old age people (65 years or over) (1). In Portugal, in 2008, falls were responsible for 72.7 % of the injuries that led people to seek for health care services (2). It is estimated that around 40% of old age people, living at home will fall at least once a year. Around one in 40 will be hospitalised due to a fall and only half will survive after a year (3).

Old age people are confronted with serious health problems of balance and falls, that are the main responsible for the lack of mobility as well as for the high mortality rate (40% of deaths from injury) and comorbidities (3). Therefore, falls represent a public health problem in the old age people and studies are necessary to contribute for understanding the causes of falls in order to lead to preventive strategies, thus reducing the inherent costs (4). The human cost of falling includes pain, distress, injury, loss of confidence and independence and mortality (5). Falling also affects the family members and caregivers of people who fall (5). The economic impact of falls is critical for family, for community and society; its costs can be divided in direct and indirect costs (6). The first costs are related with health care (medication and adequate services) and the second with social productivity losses (more involvement in activities if people did not to sustain fall-related injuries) (6).

Reduction of the risk of fall and development of preventive measures in old age people are important goals for the public health prevention (7). There is increasing concern about the best way to identify and assess the different risk factors and balance problems, but there are still many determinants unknown and others need to be more explored and developed (6).

Falls risk factors are extensive and are classified as extrinsic: factors related to the circumstances and involving society conditions; and intrinsic: factors resulting of the disease, of the effects of medicines and of physiologic alterations (8). A fall can be intrinsic, when some event or condition affects postural control, or extrinsic, when an environmental factor is the main contributor for the fall (9). Balance is therefore, a very determinant intrinsic factor to falls (10) and its deficits have many causes, some are known and others are being studied or are little known. The prevalence of deficit of balance, in the old age people is appreciated in 85 % (11).

Many balance risk factors, such as: socio-demographic conditions, age, clinical aspects have been studied (12). However, depression and anxiety symptoms, have been less studied (12), and is also less the knowledge about the risk of falls in people with neurological diseases (13). Some studies show that there is a relationship between depression/anxiety symptoms and fall (12), people with high depression and anxiety symptoms have impaired balance and this is more problematic in old age people (12), leading to the precocious loss of the functional independence, reduction of the walk speed, loss of muscular strength by immobility and lethargy (14).

The depression is the commonest mental disease in the old age people and is often undiagnosed (15). It is appreciated that the predominance of depressive symptoms in the community dwelling old age people is between 10.3% and 13.5%, thereby, in old age people that lives in institutional care it is estimated that the situation is even more critical (16). The probability of fall in old age people with depressive symptoms is 2.2 times higher, comparatively to those who have not depression symptoms (3).

The anxiety in old age people is much less studied than depression (17). However, such as depression, anxiety also affects the cognition and the behaviour of people (18). In Portugal, anxiety affects 16.5% of the adult population (19). Very often depression and anxiety symptoms are simultaneously present in old age people. In Europe, each year, 25% of the population suffers from depression or anxiety (20). The cost of mood disorders and anxiety in the EU is about €170 billion per year (20).

When comparing the rate of falls among depressed old age people and those without depression the relative risk of falls is 1.7 higher in those presenting symptomatology (21). Nevertheless, very little is known how just how anxiety and depression symptoms, separately, affect balance. It is also unknown, how these symptoms interact with these different human systems. This is important to be studied, to develop tailored/personalised treatments or interventions on old age people (10).

Therefore the aims of this study were to explore: the balance differences between old age people with presence/absence of anxiety and depression symptoms and how balance may be affected by the different levels of anxiety and depression symptoms in the same population.

## **2. METHOD**

### **2.1. STUDY DESIGN**

This was a cross-sectional exploratory quantitative study. Cross-sectional studies and quantitative method are commonly used when the issue of the study is about a cause; the etiology of a problem, a condition or a disease (22).

### **2.2. ETHICS**

Ethical approval was previously obtained from the Ethics Committee of the Research Unit of Health Sciences at the School of Nursing in Coimbra with number 238/10-2014 (Annex I).

All participants received written information about the study (Appendix I) and were reassured about the confidentiality and anonymity of all data acquired within this study. Written informed consents were obtained prior to any data collection (Appendix II).

### **2.3. PARTICIPANTS**

#### **2.3.1. RECRUITMENT**

The research was conducted in places which are frequently visited by old age people in Aveiro, Porto and Vila Real. Twenty one institutions (fifteen day care centres, five gymnasiums and one senior university) were contacted and written information about the study was provided in an arranged meeting. Nine agreed to participate and signed a written permission (Annex II) to conduct the study: Academia de Saberes de Aveiro, Casa do Professor de Aveiro, Associação de Solidariedade Humanitária de Canelas, Associação Paz e Amizade - Lar de Idosos, Lar Monte dos Burgos, Centro Social e Paroquial de Santo André de Esgueira, Centro Social Nossa Senhora do Extremo, Ginásio Fit&Fun and Ginásio Knock-out.

The direction of these institutions spoke with the medical team in order to identify eligible participants. The medical team first approached potential participants and after their expressed interest to participate they were contacted by the researcher. Further oral and written information about the study was provided. Those who accepted to participate signed the informed consent. Data collection was carried out in the different locations in an available room, always in the presence of two researchers.

#### **2.3.2. SAMPLE**

Since this was an exploratory study, it was not possible to calculate a sample size. Therefore, the maximum number of people who voluntarily accepted to participate in the study was considered.

The targeted population was healthy old age people, so a convenience sample of a healthy population aged over 65 years was included, taking into account the inclusion and exclusion criteria. For the purposes of this study, the following definition was used: a healthy person is not the one who just have absence of disease or infirmity but the one who fills a physical, mental and social well-being (23). People were included if they were: 65 years old or older; healthy with comorbidities considering their age; able to understand the objectives of the study and agree to participate voluntarily; capable of expressing opinions; spatial-temporal orientated and able to present a coherent speech. These criteria were considered to ensure that participants would understand and answer to the questionnaires consistently and could understand the exercises. People were excluded if: they had been hospitalised in the last month; showed signs of cognitive impairment or consumption of toxic substances (e.g., alcohol or drugs); presented significant musculoskeletal (e.g., were amputated), neurological (e.g., had a stroke) or cardiorespiratory (e.g., asthma) impairment that would interfere with data collection. These exclusion criteria were important because these people could score differently and thus, affect the measurements of the study.

## **2.4. DATA COLLECTION**

Data collection occurred between November 2014 and February 2015. Two trained researchers administered the protocol. A structured questionnaire, including socio-demographic, anthropometric and general clinical data was first applied. Then, the following scales were applied: ABC scale - Activities-specific Balance Confidence for self-perception of balance; HADS - The Hospital Anxiety and Depression Scale, for depression and anxiety; BESTest - Balance Evaluation Systems Test and BBS - Berg Balance Scale, for balance.

### **2.4.1. MEASURES**

Socio-demographic, anthropometric and clinical assessment were first collected to characterise the sample. The questionnaire was based on International Classification of Functioning, Disability and Health (WHO-ICF) checklist that is recommended by the World Health Organization (WHO) to capture a holistic perspective of each participant (24).

Socio-demographic data included: name, gender, date of birth, address, telephone, education, marital status, household and occupation. Anthropometric data included: weight, height and body mass index (BMI). General clinical data included: falls, fear of falling, daily medication, technical aids, respiratory/cardiac problems and physical activity.

Self-perception of balance was measured with the - Activities-specific Balance Confidence Scale (ABC). Participants rated their balance confidence performing specific activities. This scale has 16 points and each item is scored from 0 to 100 (zero represents “no confidence” and 100 represents “complete confidence”). The highest score is 2100, and the interpretation is in percentage: from 0 to 50 is low confidence, from 50 to 80 is moderate and from 80 to 100 is high confidence of balance (25). The Activities-specific Balance Confidence Scale (ABC) has shown good acceptability, reliability (both internal consistency and test-retest), validity and feasibility (26). The ABC presented better reliability levels than the FES (Falls Efficacy Scale) on test-retest reliability (95% intraclass correlation coefficient 0.89 vs. 0.58 for the FES). While the FES asks about household activities almost exclusively, the ABC considers a range of additional outdoor activities, for example using escalators with and without packages, walking on slippery surfaces, and getting into and out of cars (26). Such activities emphasise the notion of control over potentially adverse situations, and hence explore the self efficacy concept more accurately (26). The correlation between the ABC scale and the BESTest is also excellent ( $r=0.636$ ;  $p<0.01$ ) (27). It has an excellent internal consistency (Cronbach’s alpha = 0.96) (28). ABC scale has been used in elderly (29), Parkinson’s disease (30) Parkinsonism (31), stroke (32), Traumatic Brain Injury (TBI) (33) and vestibular disorders (34).

Depression and anxiety was measured with The Hospital Anxiety and Depression Scale (HADS). This scale is composed by a subscale of anxiety and a subscale of depression, each one with seven items. The answers are quantified in a Likert scale, from zero to three (35). The severity of anxiety and depression symptoms is interpreted by the following scores: between 0 and 7 is considered normal; between 8 and 10 represent mild symptoms; between 11 and 15 is moderated; and between 16 and 21 represent severe of anxiety and depression symptoms (35). The HADS was designed to be used in a hospital setting, but it can be used with members of the general public and in general practice (35). The scale has been validated in several patients’ populations (36). It has been used in Spinal Cord Injury (SCI) (37), acute stroke (38) and coronary heart disease (39). The HADS brief has an excellent internal consistency, with Cronbach scores of 0.94 for the total (0.88 on the depression subscale and 0.92 on the anxiety subscale) (40). The correlation between the HADS depression subscale and the Beck Depression Inventory Primary Care (BDI-PC) has been found to be 0.62,  $p<0.001$  (41). The Geriatric Depression Scale (GDS) also measure the depression symptoms in old age people, but the HADS can measure not only depression symptoms, but also anxiety symptoms. There are several forms of measuring the



anxiety and the depression, nevertheless the HADS has the advantage to measure simultaneously both, in the shorter and simple way (42). An important point that defers the HADS of other scales is that this one does not include the symptoms of anxiety or of depression related to physical diseases, so that there is no interference of the somatic disturbances in the evaluation (42).

Balance was measured with the BESTest and Berg Balance Scale (BBS). The BESTest has 27 items (with a total of 36 tasks), and is categorised into six balance sections: Biomechanical Constraints (tasks 1-5); Stability Limits/Verticality (tasks 6-8); Transitions/Anticipatory (tasks 9-13); Reactive (tasks 14-18); Sensory Orientation (tasks 19-20) and Stability in Gait (tasks 21-27). The total score is 108 points, and can then be calculated as a percentage score from 0 to 100 (43). This scale has been used in the following population: balance deficits (44), community dwelling adults with and without balance dysfunction (27) and Parkinson's disease (45). The BESTest has a good internal consistency and an excellent correlation between Functional Gait Assessment ( $r=0,882$ ;  $p<0,001$ ) and between BBS ( $r=0,873$ ;  $p<0,001$ ) (44).

The BBS has 14 items which assess static and dynamic activities in different degrees of difficulty. The Berg Balance Scale measures a number of different aspects of balance, both static and dynamic, and requires relatively little equipment or space (46). This scale can be used with anyone independent of age, and has been previously used in institutionalised older adults (47), elderly (48), osteoarthritis (49), Parkinson's disease (50), SCI (51), stroke (52), chronic stroke (53), TBI (54) and vestibular dysfunction (55). The BBS has high interobserver reliability: ICC=0.92 (general elderly) and ICC=0.98 (stroke) (56) and internal consistency ( $\alpha=0.96$ ) (56). The BBS has shown to be significantly correlated with other outcome measures: ABC, PEQ-MS, FAI and 2MWT ( $p\leq 0.01$ ) (57).

#### **2.4.2. PROCEDURES**

Socio-demographic measures and general clinic measures were collected by interview, as well as ABC scale and HADS. First the socio-demographic and general clinic information was collected by interview and registered in the protocol. Participants had their weight (kg) and height (cm) registered using a bathroom scale (Taurus 990537) and a tape measure. Additionally, participants' BMI was calculated [ $BMI = \text{weight in kilograms} / (\text{height in meters})^2$ ] with a portable bioimpedance device (Omron body fat monitor BF306) (58). This equipment was used inserting participant's height, weight, gender and age in the equipment. Then each participant was asked to stay standing

with both feet slightly separated; both hands holding the monitor electrodes; shoulders at 90° and elbows stretched (58).

After these sample characteristics participants were then invited to answer to some questionnaires (scales) by interview. A personal interview was conducted after providing some brief explanations about the scales to each participant.

The ABC Scale was the first to be implemented. A personal interview was conducted and each participant provided an answer to each question, about their own self balance perception. The score was measured in a percentage that was registered.

The HADS was then applied and the 26 questions were read to participants. Participants chose the option that best represented how they felt in the last week. The four possible answers of each question were read and participants chose the most adequate answer to him/her. The choice was registered by the researcher.

To evaluate participant's balance, the BESTest and the BBS were performed simultaneously, because many tasks were similar (BBS1-BESTest9; BBS2-BESTest2; BBS8-BESTest7; BBS12-BESTest12; BBS14-BESTest11; BBS7-BESTest19), saving time, avoiding repetition and being more comfortable to participants. Balance was then tested using the Berg and the BESTest scale. The Berg is more used to measure balance than the BESTest; however the Berg scale does not discriminate the different human systems responsible for balance that is why BESTest has been gaining popularity among academic and clinical fields. In both scales, between each exercise an interval of two minutes was given for participants would rest and to minimise the effect of fatigue.

The BESTest has specific procedures for each task and before each one, participants were instructed about it, and in some cases exercises were demonstrated. The tools to carry out the BESTest were provided by the researcher, according to the recommendations: chronometer; one measuring tape mounted on wall; one block (approximately 60cm x 60cm), medium-density, tempur foam; a 10 degree incline ramp; one stair step (15 cm); two stacked shoe boxes; one 2,5 kg free weight; one firm chair with arms with 3 meters in front marked with tape; and one masking tape to mark 3 m and 6 m length on the floor. The time to administer this measure was around 30 minutes.

The missing items to complete the BBS were then applied. Participants were instructed about each task, similarly to the BESTest. When participants needed external support, or help from the researcher or required supervision this was registered. In most items

participants were asked to maintain a position for a certain time, following the BBS instructions.

## **2.5. DATA ANALYSIS**

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) version 22 for Windows. A value of  $p < 0.05$  was considered statistically significant. The normality distribution of data was tested with Kolmogorov-Smirnov test (59).

Each participant was given a code in the database. Participants' identification was carried out with a code constituted by the letter B (coining press) and by a number (e.g. B1, B2, B3).

BMI was categorised in Underweight ( $< 18.5$ ), Normal (18.5-24.9), Overweight (25.0-29.9), Obesity I (30.0-34.9), Obesity II (35.0-39.9) and Obesity III ( $> 40.0$ ) (60). The obesity categories were grouped into one category ("obesity").

Type of medication was classified according to Portuguese Therapeutic Handbook (61).

The analysis of the obtained data was organised in two phases, the descriptive statistics and the inferential statistics. The descriptive statistics was used to characterise the sample and to describe and summarise the data.

HADS levels were grouped, level 1 when symptoms of anxiety and depression were Not present; 2, 3 and 4 when symptoms were Present.

The results of BESTest were compared with HADS - anxiety and depression symptoms (Present or Not present), with the Independent T-Test. The same statistical test was used for BBS and ABC.

One-way ANOVA was used to compare BESTest with HADS - level of anxiety and depression symptoms (Mil and Moderate; and Severe). The same procedure was performed for BBS and ABC.

## **3. RESULTS**

### **3.1. SAMPLE CHARACTERISTICS**

In total 155 participants were recruited. However, eight were excluded because they had the diagnosis of dementia, two were not available to participate due to spatiotemporal disorientation, three refused for personal reasons, one was amputated

and five did not fulfil the criteria of healthy old age people. Therefore, 136 participants were included in the study.

Table 1 presents the socio-demographic characteristics of the sample. Participants' mean age was 75.9±8.8 years old. Most were female 96 (70.6%), had one to four years of education (n=82; 60.3%) and were retired 126 (92.6%). In terms of marital status, most participants were widowed 64 (47.1%) or still married (n=51; 37.5%).

**Table 1: Socio-demographic characteristics of the sample (n=136)**

Characteristics	M±SD (range)	n (%)
Age (years)	75.9±8.8 (60-93)	-
Gender		
Female	-	96 (70.6)
Male		40 (29.4)
Marital status		
Single		10 (7.4)
Married	-	51 (37.5)
Separated		4 (2.9)
Divorced		7 (5.1)
Widower		64 (47.1)
Household		
Alone		33 (24.3)
Spouse	-	43 (31.6)
Children		15 (11.0)
Home Care		37 (27.2)
Other		6 (5.9)
Education (years)		
<1		17 (12.5)
1-4		82 (60.3)
5-6	-	14 (10.3)
7-9		17 (12.5)
10-12		5 (3.7)
>12		1 (0.7)
Occupation		
Paid employment		2 (1.5)
Domestic work	-	5 (3.7)
Retired		126 (92.6)
Unemployed		2 (1.5)

M±SD: Media ± Standard Deviation;; \*p<0.05

Table 2 presents in detail the general clinical characteristics of the sample. Participants' mean height and weight was 160.8±9.8 and 69.8±13.0 kg, respectively. Total BMI was 26.8±4.1; most were overweight (n=66; 48.5%) and there are no underweight participants. Most did not fall (n=96; 70.6%) last year. The mean number of falls of those who had such event was 1.3±0.5. Only five people did not take same kind of medication. Most took two (n=32; 23.5%) or three (n=34; 25%) a day. The most commonly reported were antihypertension (n=66; 50.4%), cholesterol inhibitors (n=59; 45.0%) and cardiovascular system (n=43; 32.8%). Most common technical aids used

was glasses (n=85; 62.5%) and 14.7% (n=20) of the sample used none. Last year, most of the sample had no respiratory crises (n=130; 95.6%), just two (1.5%) participants had one crises and four (2.9%) had two crises. Most participants were afraid of falling (n=75; 55.1%) had no intense (n=82; 60.3%) or moderate physical activities (n=67; 49.3%).

**Table 2: General clinical characteristics of the sample (n=136)**

Characteristics	M±SD (range)	n (%)
Height (cm)	160.8±9.8 (142.0-190.0)	-
Weight (kg)	69.8±13.0 (44.0-106.0)	-
BMI		
Underweight		0 (0.0)
Normal		47 (34.6)
Overweight	-	66 (48.5)
Obesity I		15 (11.0)
Obesity II		7 (5.1)
Obesity III		1 (0.7)
Technical aids		
None		20 (14.7)
Glasses		85 (62.5)
Dental plaque		13 (9.6)
Crutches	-	12 (8.8)
Hearing aid		3 (2.2)
Walker		2 (1.5)
Tripod		1 (0.7)
Number of medicines		
0		5 (3.7)
1		26 (19.1)
2		32 (23.5)
3	-	34 (25.0)
4		26 (19.1)
5		8 (5.9)
6		3 (2.2)
7		2 (1.5)
Last year falls		
Yes	-	40 (29.4)
No		96 (70.6)
Number of falls	1.3±0.5 (1-2)	-
Fear of falling		
Yes	-	75 (55.1)
No		61 (44.9)
Intense physical activities		
Nothing		82 (60.3)
1 to 2 times/week	-	30 (22.1)
3 times/week		24 (17.6)
Moderate physical activities	-	
Nothing		67 (49.3)
1 to 2 times/week		30 (22.1)
3 to 4 times/week		21 (15.4)
≥5 times/week		18 (13.2)

M±SD: Mean ± Standard Deviation; BMI: Body Mass Index; \*p<0.05

### 3.2. BALANCE, BALANCE CONFIDENCE, ANXIETY AND DEPRESSION

Table 3 describes the balance performance (BESTest and BBS) and balance confidence (ABC) for the total sample and according to the presence/absence of anxiety and depression symptoms.

When anxiety or depression symptoms were not present participants' presented better balance performance scores in all sections of the BESTest, than when those symptoms were present. Stability in Gait was the section which scored higher in the presence of anxiety ( $90.5 \pm 10.4$ ;  $p < 0.001$ ) or depression symptoms ( $90.3 \pm 10.3$ ;  $p < 0.001$ ). In the absence of anxiety symptoms, the section where participants presented worse performance was the Stability Limits/Verticality ( $78.2 \pm 17.9$ ;  $p < 0.001$ ) whereas in the absence of depression symptoms the Sensory Orientation was the one scoring less ( $79.8 \pm 17.1$ ;  $p < 0.001$ ).

The BBS showed that participants score better in the absence of depression ( $52.9 \pm 4.2$ ;  $p < 0.001$ ) than in the absence of anxiety symptoms ( $51.6 \pm 6.2$ ;  $p < 0.001$ ). Participants' confidence (ABC) without anxiety symptoms was  $84.9 \pm 19.1\%$  ( $p < 0.010$ ) and without depression symptoms was  $86.5 \pm 19.6\%$  ( $p < 0.001$ ).

All BESTest sections were significantly affected by the presence of anxiety or depression symptoms, however, the Reactive, section four, presented the larger difference (anxiety: present  $49.4 \pm 21.1$  vs. not present  $84.2 \pm 14.9$ ;  $p < 0.001$ ; depression: present  $46.3 \pm 30.3$  vs. not present  $88.5 \pm 15.3$ ;  $p < 0.001$ ). In the presence of anxiety and depression symptoms, the best results were obtained on Biomechanical Constraints section (anxiety:  $68.5 \pm 20.1$ ; depression:  $64.9 \pm 18.9$ ;  $p < 0.001$ ).

The results of the Berg Balance Scale also indicated that balance was significantly affected by the presence of anxiety or depression symptoms (anxiety: present  $42.4 \pm 11.0$  vs. not present  $51.6 \pm 6.2$ ;  $p < 0.001$ ; depression: present  $42.1 \pm 9.8$  vs. not present  $52.9 \pm 4.2$ ;  $p < 0.001$ ). For both balance scales people with depression symptoms presented significantly more balance deficits than those with anxiety symptoms (BESTest (anxiety)  $88.2 \pm 10.0$ ;  $71.9 \pm 16.4$ ;  $p < 0.001$ ; BESTest (depression)  $90.0 \pm 8.6$ ;  $70.1 \pm 16.3$ ;  $p < 0.001$ ).

Similarly, the balance confidence was also significantly affected by the presence of anxiety and depression symptoms however, the balance confidence was significantly more affected in participants with depression than in those with anxiety symptoms (ABC (anxiety)  $84.9 \pm 19.1$ ;  $74.9 \pm 25.3$ ;  $p = 0.010$  ; ABC (depression)  $86.5 \pm 19.6$ ;  $73.2 \pm 24.1$ ;  $p = 0.001$ ).

**Table 3: Results of the BESTest, Berg and ABC scales for the total sample and according to the presence/ absence of symptoms of anxiety and depression (n=136)**

	HADS - Symptoms of Anxiety			HADS - Symptoms of Depression		
	Not present (n=71)	Present (n=65)	p	Not present (n=70)	Present (n=66)	p
BESTest						
1. Biomechanical Constraints	79.8±19.9	68.5±20.1	<0.001	83.9±14.3	64.9±18.9	<0.001
2. Stability Limits/Verticality	78.2±17.9	62.0±21.4	<0.001	80.3±15.1	59.5±20.4	<0.001
3. Transitions/Anticipatory	79.7±19.6	60.7±21.5	<0.001	83.0±13.9	59.9±20.2	<0.001
4. Reactive	84.2±14.9	49.4±21.1	<0.001	88.5±15.3	46.3±30.3	<0.001
5. Sensory Orientation	80.6±22.3	57.3±27.4	<0.001	79.8±17.1	59.2±27.2	<0.001
6. Stability in Gait	90.5±10.4	64.7±23.0	<0.001	90.3±10.3	63.2±24.7	<0.001
Total	88.2±10.0	71.9±16.4	<0.001	90.0±8.6	70.1±16.3	<0.001
BBS	51.6±6.2	42.4±11.0	<0.001	52.9±4.2	42.1±9.8	<0.001
ABC	84.9±19.1	74.9±25.3	0.010	86.5±19.6	73.2±24.1	0.001

Results are presented as: M±SD: Mean ± Standard Deviation; p: p-value; BBS: Berg Balance Scale; ABC: Activities-specific Balance Confidence; HADS: Hospital Anxiety and Depression Scale.

Table 4 shows that the levels of anxiety and depression symptoms also significantly affect participant's balance in the BESTest total score and all different sections, and BBS, with the more severe levels presenting significantly worse balance results.

The level of the symptoms influenced significantly the BBS score. Symptoms of anxiety mild and moderate: 44.7±11.3, severe: 37.5±8.8, p=0.013); symptoms of depression mild and moderate: 44.2±10.1, severe: 38.6±6.9, p=0.029.

The Reactive was the section with the worst score in both symptoms (anxiety mild and moderate: 55.9±35.8, severe: 35.7±28.5, p=0.027; depression mild and moderate: 51.1±31.4, severe: 6.2±21.8, p=0.029). The total of BESTest had the best balance score.

The Sensory Orientation presented significantly lower scores in participants with severe depression symptoms (39.0±17.1) than with mild/moderate symptoms (67.6±26.1). The same happened for the total BESTest score (mild/moderate symptoms: 74.5±16.2 and severe symptoms: 36.2±29.9; p<0.001).

Sensory Orientation section was the most affected by the severity of anxiety and depression symptoms (anxiety mild and moderate: 65.3±26.3, severe: 38.0±18.9; p<0.001; depression mild and moderate: 67.6±26.1, severe: 39.0±17.1; p<0.001).

Biomechanical Constraints was the section that was less affected by severity of anxiety and depression levels (anxiety mild and moderate: 70.8±22.7, severe: 63.3±8.0, p=0.023; depression mild and moderate: 63.4±19.2, severe: 51.3±21.0, p=0.023) though was been significance.

The BESTest was significantly different in all sections according to level of anxiety and depression symptoms. All scores showed that the high severity of anxiety and depression symptoms influences negatively the score in the BESTest.

Balance confidence was not significantly affected by the level of anxiety or depression symptoms (Table 4).

**Table 4: BESTest, Berg and ABC according level of Anxiety and Depression symptoms**

	Level of Anxiety			Level of Depression		
	Mild and Moderate (n=44)	Severe (n=21)	p	Mild and Moderate (n=46)	Severe (n=20)	p
BESTest 1. Biomechanical Constraints	70.8±22.7	63.3±8.0	0.023	63.4±19.2	51.3±21.0	0.023
2. Stability Limits/Verticality	66.6±20.8	52.4±19.9	0.011	65.6±20.9	63.5±14.2	0.046
3. Transitions/Anticipatory	65.5±23.0	48.6±10.4	0.003	64.0±21.7	49.5±10.7	0.006
4. Reactive	55.9±35.8	35.7±28.5	0.027	51.1±31.4	36.2±21.8	0.029
5. Sensory Orientation	65.3±26.3	38.0±18.9	<0.001	67.6±26.1	39.0±17.1	<0.001
6. Stability in Gait	71.1±23.5	51.3±15.1	0.001	67.5±27.0	52.2±13.7	0.019
Total	77.0±15.5	61.2±12.9	<0.001	74.5±16.2	60.9±12.6	0.001
Berg	44.7±11.3	37.5±8.8	0.013	44.2±10.1	38.6±6.9	0.029
ABC	73.5±28.5	77.9±16.7	0.516	71.0±24.7	78.1±22.3	0.274

Results are presented as: M±SD: Mean ± Standard Deviation; p: p-value; BBS: Berg Balance Scale; ABC: Activities-specific Balance Confidence; HADS: Hospital Anxiety and Depression Scale.

#### 4. DISCUSSION

This study explored the balance differences in old age people with presence/absence of anxiety and depression symptoms and how balance was affected by the different levels of anxiety and depression symptoms in the same population. It was shown that a significant proportion of participants living in the community present anxiety and depression symptoms and the presence of such symptomatology significantly decreases balance performance and confidence in old age people. This study also showed that the severity of anxiety and depression symptoms significantly decreases balance performance but do not seem to impact significantly on balance confidence.



The high proportion of participants presenting anxiety and depression symptoms, is in line with previous research that has shown that depression is a frequent mental illness in old age people (16) and with age, anxiety is also more frequent (17). Nevertheless, these symptoms are not commonly valued in old age people. It is common and wrongly thought that it is normal people be depressed and anxious when they start to be older. This needs special attention as it has been demonstrated that a depressive state of mind in old age people can increase risk of falls (62). Nevertheless, the specific relationships between balance deficits and presence/absence of anxiety have been little explored.

Some studies showed that brain stem centres are responsible for postural responses, speed and flexibility (63), and people with depression or anxiety symptoms have many brain areas affected (64). Another study, with people with some neurological diseases (stroke, dementia, Parkinson disease, depression, epilepsy, vertigo) showed that participants with mild to moderate neurological impairments had an incidence of falls three times higher than participants without any neurological symptoms (13). Therefore, when the anxiety or depression symptoms are present, people have the balance performance affected, as it has been shown in this present study. However, some balance systems can be more affected than others (13).

In fact, using the BESTest it was possible to observe that in old age people the Reactive section is the most affected when anxiety or depression symptoms are present. It is known that presence of anxiety and depression symptoms cause poor concentration (65). The Reactive section assesses postural responses and considerable levels of concentration are often needed to respond adequately to this section. The symptoms of depression cause deficit of attention, incapacity of quickly reactions, and apathy (66) and anxiety symptoms cause tension, anxious responses and less concentration (67). Therefore, such as in the presence of anxiety or depression symptoms, postural responses are affected, and consequently, the Reactive section of the BESTest too. In patients with sensory neuropathy, multiple sclerosis or Parkinson disease the reactive (automatic postural responses) are weak and late (27). For the same reason, Stability in Gait and Sensory Orientation are the second sections most affected by symptoms of anxiety and depression. These two sections also require early responses and rapidly triggered (63).

On the other hand, participants presented the best scored in the Biomechanical section, even in the presence of depression or anxiety symptoms. This finding may be explained by the fact that in this section people need to be mechanic in the exercises,

do not need to think much, it is practical and physical (27). In light of this evidence it is not surprising that when the severity of the symptoms increased, participants presented less balance performance.

It has been shown that balance performance is also strongly associated with balance confidence in old age people (68). Psychological complications related to falls (fear of falling, loss of self-efficacy, activity avoidance and loss of self-confidence) are experienced by old age people (69). The presence of anxiety or depression symptoms causes less confidence (67), therefore, balance confidence it is also compromised. It is known that a bad self-balance perception can compromise balance and anxiety has been shown to be a mediator of the relationship between self-reported dizziness and falls (70).

However, the direct association between severity of depression and anxiety symptoms and balance did not occur for self-confidence of balance. Fall-related psychological concerns have been shown to be independently associated with the severity of anxiety and depression (71). In fact, old age people with less confidence in balance can present high or low intensity body reactions, independently of the level of the depression or anxiety symptoms (72). The findings from this study are in line with what has been described, i.e., self balance perception is worse when symptoms of anxiety or depression are present but the severity of the symptoms do not seem to be determinants for a worse self-perception of balance.

Some limitations of this study need to be acknowledged. The sample of this study was relatively small to explore the impact of all severity stages of anxiety and depression symptoms on balance. Therefore, the stages mild and moderate were grouped. A larger sample would strengthen these findings per severity stage of symptom.

The protocol required a considerable amount of time to be applied (approximately one hour) to each participant, mainly in the less agile people, because two balance performance tests were performed. As BESTest was more informative and similar findings were observed with BBS; future studies should consider which scale to use taking into account the study aims, i.e., if the aim is to obtain more detailed information to develop tailored interventions then, BESTest would be more appropriate; on the other hand, if the aim is just to assess balance performance then applying BBS would provide the information required in less time.

The sample of this study presented a mean age of  $75.9 \pm 8.8$  years old and therefore, these findings may not represent an older age population ( $+80$ ). A similar study

conducted with an older population is also warranted. Nevertheless, some important normative values were established, enhancing our understanding on balance performance and confidence in older age people, and those might be useful as comparators when conducting studies with other populations.

## **5. CONCLUSIONS**

This study has shown that the presence of anxiety and depression symptoms significantly decreases balance performance and balance confidence in old age people. The severity of symptoms significantly decreases balance performance but do not seem to significantly impact on balance confidence.

The anxiety and depression tends to increase in old age people, and their mobility as well as balance tends to decrease (73). Moreover, the reaction section of BESTest seems to be the most affected whereas the biomechanical is relatively preserved. These information raise awareness for the importance of treating anxiety and depression symptoms and develop tailored interventions directed to the specific needs of old age people. This seems fundamental to tackle this public health problem which is preventing falls.

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## **Annex I – Ethics approval**

## COMISSÃO DE ÉTICA

da **Unidade Investigação em Ciências da Saúde: Enfermagem** (UICISA: E)  
da **Escola Superior de Enfermagem de Coimbra** (ESENFC)

**Parecer Nº 238/10-2014**

**Título do Projecto:** Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa.

### Identificação das Proponentes

**Nome(s):** Joana Carvalho Santos e Sara Isabel Lebre de Almeida

**Filiação Institucional:** Escola Superior de Saúde da Universidade de Aveiro

**Investigador Responsável/Orientador:** Prof.ª Alda Sofia Pires de Dias Marques (PhD)

**Relator:** Rogério Manuel Clemente Rodrigues

### Parecer

As proponentes, propõem-se realizar, no âmbito de Curso Mestrado em Gerontologia da Escola Superior de Saúde da Universidade de Aveiro, estudo com o objectivo de "(...) avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa e compará-los entre subgrupos populacionais".

O estudo é definido como "exploratório" "transversal e quantitativo".

A população do estudo inclui residentes na comunidade, residentes em lar (Lar Monte dos Burgos - Porto) e utentes de outras instituições da cidade de Aveiro (Academia de Saberes de Aveiro; Ginásio Fit&Fun; e Health Club Knock-Out). São indicadas, e apresentadas as autorizações, das instituições onde irá decorrer o estudo. A amostra será obtida por conveniência não estando definido o seu tamanho.

Não o sendo expressamente referido, depreende-se que o contacto com os participantes e a recolha de dados será efectuada pelas proponentes.

No documento apresentado:

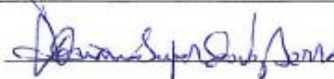
- É justificada a utilidade do estudo para o planeamento das intervenções junto da população alvo;
- Estão definidos os critérios de inclusão;
- Os instrumentos de recolha de dados são apresentados;
- A recolha de dados decorrerá nas instituições participantes ou em casa dos participantes;
- É garantida a participação livre, voluntária e informada dos participantes;
- É obtido o consentimento informado dos participantes;
- É garantida a confidencialidade dos dados recolhidos;
- Não são identificados danos, ou custos, para os participantes.

Pelo exposto o parecer desta Comissão é favorável ao estudo tal como apresentado.

O relator:



Data: 19/11/2014 O Presidente da Comissão de Ética:



## **Annex II – Institutions' approval**

### Autorização Institucional

Eu, Sara Mariana Carneiro Teixeira responsável pela instituição Associação de Solidiedade Humanitária de Carnelas declaro que fui informado dos objetivos do estudo científico intitulado "Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa", e concordo em autorizar a execução da mesma nesta instituição. Caso necessário, a qualquer momento como instituição CO-PARTICIPANTE desta investigação podemos revogar esta autorização, se comprovadas atividades que causem algum prejuízo a esta instituição ou ainda, a utilização de qualquer dado que comprometa o sigilo da participação dos integrantes desta instituição. Declaro também, que nós enquanto instituição, bem como os participantes não recebemos qualquer pagamento por esta autorização.

Sara Mariana Carneiro Teixeira

12/01/2015



Representante da Instituição

Data

Assinatura

Sara Isabel Leão de Almeida

12/01/2015

Sara Almeida

Investigadora

Data

Assinatura

Joana Santos

12/01/2015

Joana Santos

Investigadora

Data

Assinatura

### Autorização Institucional

Eu, Hector Antunes Silva responsável pela instituição APA - Lar de Idosos declaro que fui informado dos objetivos do estudo científico intitulado "Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa", e concordo em autorizar a execução da mesma nesta instituição. Caso necessário, a qualquer momento como instituição CO-PARTICIPANTE desta investigação podemos revogar esta autorização, se comprovadas atividades que causem algum prejuízo a esta instituição ou ainda, a utilização de qualquer dado que comprometa o sigilo da participação dos integrantes desta instituição. Declaro também, que nós enquanto instituição, bem como os participantes não recebemos qualquer pagamento por esta autorização.

Hector Silva 23/11/2014 [Assinatura]  
Representante da Instituição      Data      Assinatura

Sara Santos 23/11/2014 [Assinatura]  
Investigadora      Data      Assinatura

Sara Almeida 23/11/2014 [Assinatura]  
Investigadora      Data      Assinatura

### Autorização Institucional

Eu, Luís João Santos Trigueiros responsável pela instituição Casa do Professor declaro que fui informado dos objetivos do estudo científico intitulado "Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa", e concordo em autorizar a execução da mesma nesta instituição. Caso necessário, a qualquer momento como instituição CO-PARTICIPANTE desta investigação podemos revogar esta autorização, se comprovadas atividades que causem algum prejuízo a esta instituição ou ainda, a utilização de qualquer dado que comprometa o sigilo da participação dos integrantes desta instituição. Declaro também, que nós enquanto instituição, bem como os participantes não recebemos qualquer pagamento por esta autorização.

<u>Luís João Santos Trigueiros</u>	<u>23.12.2014</u>	<u>Luís</u>
Representante da Instituição	Data	Assinatura
<u>Sara Isabel Neves de Almeida</u>	<u>23/12/2014</u>	<u>Sara Almeida</u>
Investigadora	Data	Assinatura
<u>Joana Carvalho Santos</u>	<u>23/12/2014</u>	<u>Joana Santos</u>
Investigadora	Data	Assinatura

### Autorização Institucional

Eu, Juana Maria Feixosa Fernandes Anacleto responsável pela instituição Centro Social e Paroquial Santo André declaro que fui informado dos objetivos do estudo científico intitulado "Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa", e concordo em autorizar a execução da mesma nesta instituição. Caso necessário, a qualquer momento como instituição CO-PARTICIPANTE desta investigação podemos revogar esta autorização, se comprovadas atividades que causem algum prejuízo a esta instituição ou ainda, a utilização de qualquer dado que comprometa o sigilo da participação dos integrantes desta instituição. Declaro também, que nós enquanto instituição, bem como os participantes não recebemos qualquer pagamento por esta autorização.

[Assinatura]

Representante da Instituição

02.12.2014

Data

[Assinatura]

Assinatura

Joana Santos

Investigadora

2/12/2014

Data

[Assinatura]

Assinatura

Sara Isabel da Silva de Almeida

Investigadora

2/12/2014

Data

[Assinatura]

Assinatura

### Autorização Institucional

Eu, Rui Manuel Agostinho Pereira Machado responsável pela instituição Centro Social do 1.º de Extremo declaro que fui informado dos objetivos do estudo científico intitulado “Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa”, e concordo em autorizar a execução da mesma nesta instituição. Caso necessário, a qualquer momento como instituição CO-PARTICIPANTE desta investigação podemos revogar esta autorização, se comprovadas atividades que causem algum prejuízo a esta instituição ou ainda, a utilização de qualquer dado que comprometa o sigilo da participação dos integrantes desta instituição. Declaro também, que nós enquanto instituição, bem como os participantes não recebemos qualquer pagamento por esta autorização.

	<u>2/02/2015</u>	_____
	Data	Assinatura
<u>Yolana Carvalho Santos</u>	<u>2/02/2015</u>	<u>[Signature]</u>
Investigadora	Data	Assinatura
<u>Sara Lebre Almeida</u>	<u>2/02/2015</u>	<u>[Signature]</u>
Investigadora	Data	Assinatura



### Autorização Institucional

Eu, MARIA ISaura FERZEIRA REGALADO RIBEIRO responsável pela instituição LAR DO MONTE DOS BURGOS declaro que fui informado dos objetivos do estudo científico intitulado "Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa", e concordo em autorizar a execução da mesma nesta instituição. Caso necessário, a qualquer momento como instituição CO-PARTICIPANTE desta investigação podemos revogar esta autorização, se comprovadas atividades que causem algum prejuízo a esta instituição ou ainda, a utilização de qualquer dado que comprometa o sigilo da participação dos integrantes desta instituição. Declaro também, que nós enquanto instituição, bem como os participantes não recebemos qualquer pagamento por esta autorização.

DIRECTORA

Representante da Instituição

13.10.2014

Data

  
Lar Monte dos Burgos  
**KOSD**  
Lar Monte dos Burgos  
Centro de Cultura e Desporto  
das Tradições da Segurança  
Assinatura  
13/10/14 Porão

Jana Carvalho Santos

Investigadora

13/10/2014

Data

Jana Carvalho Santos

Assinatura

Sara Isabel Alves da Almeida

Investigadora

13/10/2014

Data

Sara Almeida

Assinatura

### Autorização Institucional

Eu, Francisco de Almeida Gomes responsável pela instituição Fit & Fun Aveiro declaro que fui informado dos objetivos do estudo científico intitulado "Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa", e concordo em autorizar a execução da mesma nesta instituição. Caso necessário, a qualquer momento como instituição CO-PARTICIPANTE desta investigação podemos revogar esta autorização, se comprovadas atividades que causem algum prejuízo a esta instituição ou ainda, a utilização de qualquer dado que comprometa o sigilo da participação dos integrantes desta instituição. Declaro também, que nós enquanto instituição, bem como os participantes não recebemos qualquer pagamento por esta autorização.

<u>Francisco Gomes</u>	<u>24/10/2014</u>	<u>f.gomes</u>
Representante da Instituição	Data	Assinatura

<u>Jana Cavalho Santos</u>	<u>24/10/2014</u>	<u>passquitos</u>
Investigadora	Data	Assinatura

<u>Sara Isabel Neves de Almeida</u>	<u>24/10/2014</u>	<u>Sara Almeida</u>
Investigadora	Data	Assinatura

### Autorização Institucional

Eu, Maria Carolina de Freitas Morado responsável pela instituição Academia de Saberes de Aveiro declaro que fui informado dos objetivos do estudo científico intitulado "Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa", e concordo em autorizar a execução da mesma nesta instituição. Caso necessário, a qualquer momento como instituição CO-PARTICIPANTE desta investigação podemos revogar esta autorização, se comprovadas atividades que causem algum prejuízo a esta instituição ou ainda, a utilização de qualquer dado que comprometa o sigilo da participação dos integrantes desta instituição. Declaro também, que nós enquanto instituição, bem como os participantes não recebemos qualquer pagamento por esta autorização.

<u>Maria Carolina de Freitas Morado</u>	<u>20/10/2014</u>	<u>Maria Carolina de Freitas Morado</u>
Representante da Instituição	Data	Assinatura
<u>Joana Carvalho Santos</u>	<u>20/10/2014</u>	<u>Joana Carvalho Santos</u>
Investigadora	Data	Assinatura
<u>Sara Isabel Nobre de Almeida</u>	<u>20/10/2014</u>	<u>Sara Almeida</u>
Investigadora	Data	Assinatura

## **Appendix I – Informed Consent**

## Termo de Consentimento Livre e Esclarecido do Participante

**Título do Projeto:** Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa.

**Nome do investigador principal:** Alda Marques

Por favor leia e assinale com uma cruz (X) os quadrados seguintes.

1. Eu confirmo que percebi a informação que me foi dada e tive a oportunidade de questionar e de me esclarecer.
  
2. Eu percebo que a minha participação é voluntária e que sou livre de desistir, em qualquer altura, sem dar nenhuma explicação, sem que isso me afete de alguma forma.
  
3. Eu compreendo que os dados recolhidos durante a investigação são confidenciais e que só os investigadores do projeto da Universidade de Aveiro têm acesso a eles. Portanto, dou autorização para que os mesmos tenham acesso a esses dados.
  
4. Eu percebo que os resultados do estudo serão publicados numa dissertação de mestrado e jornais e/ou conferências científicas sem que a minha identidade (e.g., nome e idade) seja revelada. E dou portanto, autorização para a utilização dos dados para esses fins.
  
5. Eu concordo então em participar no estudo.

\_\_\_\_\_  
Nome do Participante                      Data                      Assinatura

\_\_\_\_\_  
Nome da Testemunha                      Data                      Assinatura

\_\_\_\_\_  
Nome do Investigador                      Data                      Assinatura

## **Appendix II – Information sheets to the Participants**

### **Folhas de Informação ao Participante**

As estudantes Joana Carvalho Santos e Sara Isabel Lebre de Almeida, a frequentar o Mestrado de Gerontologia da Escola Superior de Saúde da Universidade de Aveiro, sob a orientação científica da Professora Doutora Alda Sofia Pires de Dias Marques, vêm por este meio solicitar-lhe a autorização para participar no estudo intitulado: “Avaliar os diferentes sistemas responsáveis pelo equilíbrio na população idosa”.

Antes de decidir, deve compreender o motivo da realização da investigação e o que a mesma envolve. Por favor, leia com atenção a informação e, se houver algo que não esteja claro para si ou se necessitar de informações adicionais não hesite em contactar as estudantes ou a orientadora (contactos no final do documento).

#### **Qual o propósito do estudo?**

Este estudo tem como objetivo avaliar os diferentes sistemas responsáveis pelo equilíbrio nas pessoas idosas e comparar os resultados entre subgrupos populacionais. Com este estudo pretende-se avaliar o que está preservado e/ou alterado no equilíbrio das pessoas idosas, contribuindo para o futuro planeamento de políticas públicas e para a elaboração de programas de saúde preventivos relativamente às quedas.

#### **Porque fui escolhido?**

Foi escolhido para participar porque é uma pessoa saudável com idade igual ou superior a 60 anos, que tem capacidade de expressar opiniões e apresenta discurso coerente e orientação espaço-temporal.

#### **Tenho de participar?**

A decisão de participar ou não é completamente sua. Se decidir participar ser-lhe-á pedido que assinie dois consentimentos informados, um para si e outro para as estudantes de Mestrado. É livre de desistir a qualquer altura do estudo, sem que tenha de dar qualquer justificação.

#### **O que acontece após aceitar participar?**

Se aceitar participar ser-lhe-á pedido que preencha o consentimento informado anexo a esta folha e só depois se iniciará a aplicação do protocolo de recolhas de dados.

Inicialmente serão feitas algumas perguntas de carácter sociodemográfico e será recolhida alguma informação sobre a sua saúde. Neste campo serão recolhidos o seu peso em quilogramas (kg) e a sua altura em centímetros (cm).

Será também avaliada a bioimpedância onde lhe será pedido que agarre com as suas mãos um pequeno aparelho que fará a leitura automática da sua percentagem de massa gorda corporal, em breves segundos.

Depois destes testes breves, ser-lhe-á solicitado o preenchimento de três breves escalas. A escala Avaliação da Qualidade de Vida da Organização Mundial de Saúde que avalia a sua qualidade de vida e é constituída por 26 perguntas que seguem uma escala de Likert de 1 a 5,

ou seja, quanto maior a pontuação melhor a qualidade de vida. É constituída por 4 domínios que são: físico, psicológico, relações sociais e meio ambiente. A escala de Confiança no Equilíbrio Específica para a Atividade (ABC Scale) é constituída por algumas questões (nº 2, nº 9, nº 11, nº 14 e nº 15) que dizem respeito a atividades complementares: confiança ao subir e descer escadas (questão nº 2), confiança ao entrar e sair de um carro (questão nº 9), confiança ao subir e descer uma rampa (questão nº 11), confiança ao entrar e sair de uma escada rolante (questões nº 14 e nº 15). E por fim, a escala de Ansiedade e Depressão Hospitalar (HADS) que é composta por uma subescala de ansiedade e uma subescala de depressão, ambas constituídas por sete itens. Cada item permite a escolha entre quatro opções de resposta, em que a pessoa deve escolher aquela que corresponde à forma como se tem sentido durante a última semana.

De seguida, iniciar-se-á uma avaliação da atividade física com duas perguntas sobre a sua atividade física semanal. Ser-lhe-á solicitado que caminhe num corredor para realizar o Teste de Marcha dos 10 Metros enquanto o tempo é cronometrado. O teste é realizado 3 vezes à velocidade de marcha mais rápida possível.

Para avaliar a força muscular ser-lhe-á pedido que se sente e se levante com os braços cruzados sobre o peito e com as costas contra o encosto da cadeira, cinco vezes enquanto a investigadora regista com um cronómetro o tempo que lhe demorará a executar esta tarefa (Teste de Sentar e Levantar Cinco Vezes – Five times Sit to Stand Test).

A flexibilidade será avaliada pelo Chair sit and reach test (Teste de sentar na cadeira e alcançar) no qual lhe será pedido que se sente na parte anterior do assento da cadeira, coloque um joelho em extensão (anca a 0º de abdução), o calcanhar no chão e o pé em posição neutra. Em seguida deverá levar o seu tronco à frente, mantendo a coluna e a cabeça alinhadas, e deslizar com os braços esticados e as mãos sobrepostas sobre o membro em extensão, numa tentativa de tocar nos dedos dos pés (expirar na descida). Deve manter a posição máxima por 2 segundos. Realizar-se-ão as medições 3 vezes.

Por fim serão aplicadas as escalas de Berg (14 itens) e o BESTest (27 itens) em simultâneo, estas consistem em avaliar o equilíbrio através das restrições biomecânicas, dos limites de estabilidade/verticalidade, das transições/antecipatório, das respostas posturais reativas, da orientação sensorial e da estabilidade na marcha.

**Quais são os efeitos secundários dos procedimentos do estudo?**

Não existem efeitos secundários de participar no estudo.

**Quais são as possíveis desvantagens e riscos se resolver participar?**

Não existem quaisquer desvantagens ou riscos de participar no estudo.

**Quais são os possíveis benefícios da minha participação?**

Não existem benefícios diretos de participar no estudo. No entanto, a informação que obtivermos através do estudo permitirá identificar o que está preservado ou alterado no



equilíbrio das pessoas idosas, informando futuras intervenções para prevenção de quedas nesta população.

**A participação será confidencial?**

A informação recolhida durante o estudo será confidencial. Os dados recolhidos para a base de dados não serão gravados com o nome dos participantes, mas sim com um código, para que ninguém os identifique. As bases de dados estarão num computador protegido com palavra-passe e só os investigadores do estudo terão acesso às mesmas.

**O que acontecerá aos resultados do estudo?**

Os resultados do estudo serão analisados e integrarão as dissertações de Mestrado, podendo ser publicados como estudos científicos. Contudo, em nenhum momento será identificado.

**Contactos para mais informações sobre o estudo**

Se ficou com alguma dúvida ou se pretende obter mais informações sobre o estudo, pode telefonar ou escrever para:

Alda Sofia de Dias Marques, Joana Carvalho Santos e Sara Isabel Lebre de Almeida.

Escola Superior de Saúde da Universidade de Aveiro,  
Universidade de Aveiro,  
Campus de Santiago,  
Edifício III, 3810-193, Aveiro  
Telefone: 234 247 113 ou 234 372 462  
e-mail: [joanacarvalhosantos@ua.pt](mailto:joanacarvalhosantos@ua.pt); [saralebre@ua.pt](mailto:saralebre@ua.pt); [amarques@ua.pt](mailto:amarques@ua.pt)

Muito obrigada por ter lido esta informação.

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Se pretender obter uma cópia de qualquer relatório ou publicação, por favor indique o seu contacto de e-mail no espaço seguinte:

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