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EFEITOS DO PROGRAMA DE REABILITAÇÃO MOTORA SQUI2 EM IDOSOS INSTITUCIONALIZADOS: ESTUDO QUASE-EXPERIMENTAL

EFFECTS OF SQUI2 MOTOR REHABILITATION PROGRAMME ON INSTITUTIONALISED ELDERLY: QUASI-EXPERIMENTAL STUDY

EFECTOS DEL PROGRAMA DE REHABILITACIÓN MOTORA SQUI2 EN ANCIANOS INSTITUCIONALIZADOS: UN ESTUDIO CUASIEXPERIMENTAL

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RESUMO

Introdução: O envelhecimento está comummente associado a deteriorações nos sistemas neurológico e musculoesquelético, que limitam progressivamente a capacidade de os idosos realizarem as suas Atividades de Vida Diárias (AVD) e aumentam o risco de queda. Programas de exercício físico como o "Stop Quedas Idosos Institucionalizados" (SQuI2), levados a cabo por autores capacitados como o Enfermeiro Especialista em Enfermagem de Reabilitação (EEER), têm-se provado eficazes na redução dos episódios de queda entre idosos. Pretende-se avaliar o efeito da aplicação do programa SQuI2 na dependência, equilíbrio, capacidade de marcha, força muscular e risco de queda nos idosos institucionalizados numa Estrutura Residencial para Pessoas Idosas (ERPI) da região Norte.

Metodologia: Estudo quase-experimental, amostragem não probabilística por conveniência de idosos institucionalizados (n=22). A dependência, o equilíbrio, a capacidade de marcha, a força muscular e o risco de queda foram as variáveis monitorizadas mensalmente, durante 6 meses. Instrumentos utilizados: índice de Barthel, escalas de Berg, Holden, Morse e Medical Research Council Modificado.

Resultados: Observaram-se alterações estatisticamente significativas: diminuição do grau de dependência (37,5 vs. 65,0; p<0,001); aumento do equilíbrio (4,0 vs. 26,5; p<0,001), capacidade de marcha (0,0 vs. 3,0; p<0,001) e força muscular (4,0 vs. 5,0; p<0,001).

Discussão: O SQuI2 possibilitou uma menor dependência na deambulação e Atividades Vida Diária. Existiu um aumento do risco de queda pelo facto do idoso tentar realizar a sua marcha.

Conclusão: O SQuI2 melhorou o nível de dependência, equilíbrio, capacidade de marcha e força muscular, todavia, não teve efeito estatisticamente significativo no risco de queda. Este estudo permite repensar o envelhecimento e os modelos tradicionais das ERPI. Oferece ainda evidência científica para uma prática mais direcionada, reforçando a eficácia do SQuI2 e o papel fundamental do EEER na melhoria da autonomia de idosos institucionalizados.

Descritores: Acidentes por quedas; Enfermagem em Reabilitação; Equilíbrio Postural; Força Muscular; Independência Funcional; Marcha.

ABSTRACT

Introduction: Ageing is commonly associated with neurological and musculoskeletal systems deterioration, which progressively limits the ability of elderly to perform their Daily Living Activities and increases the risk of falls. Exercise programs such as "Stop Quedas Idosos Institucionalizados" (SQuI2), implemented by skilled professionals such as Rehabilitation Nurses (RN), have been shown to be effective in reducing elderly falls. The aim is to evaluate the effect of the SQuI2 program on dependency, balance, walking ability, muscle strength and fall risk among institutionalized elderly people in a residential facility in the northern region of Portugal.

Methodology: Quasi-experimental study, non-probability convenience sampling of institutionalized elderly people (n=22). Dependence, balance, walking ability, muscle strength and the risk of falling were the variables monitored monthly for 6 months. Instruments used: Barthel index; Berg, Holden and Morse scales; and Modified Medical Research Council.

Results: Statistically significant changes were observed: a reduction in the degree of dependence (37.5 vs 65.0; p<0.001); an increase in balance (4.0 vs. 26.5; p<0.001), walking ability (0.0 vs. 3.0; p<0.001) and muscle strength (4.0 vs. 5.0; p<0.001).

Discussion: The SQuI2 allowed less dependence in walking and Daily Living Activities. There was an increased risk of falls because the elderly tried to walk.

Conclusion: SQuI2 improved the level of dependence, balance, walking ability and muscle strength, but had no statistically significant effect on the risk of falling. This study makes it possible to rethink ageing and traditional residential facilities models for elderly people. It also provides scientific evidence for a more targeted practice, reinforcing the effectiveness of SQuI2 and the fundamental role of the RN in improving the autonomy of institutionalized elderly people.

Descriptors: Accidental Falls; Rehabilitation Nursing; Postural Balance; Muscle Strength; Functional Independence; Gait.

RESUMEN

Introducción: El envejecimiento está comúnmente asociado a deterioraciones en los sistemas neurológico y musculoesquelético, que limitan progresivamente la capacidad de los ancianos para realizar sus actividades diarias y aumentan el riesgo de caída. Los programas de ejercicio físico, como el *"Stop Quedas Idosos Institucionalizados"* (SQuI2), realizados por profesionales cualificados como, por ejemplo, enfermeros de rehabilitación, han demostrado su eficacia para reducir los episodios de caída entre los ancianos. El objetivo del estudio es evaluar el efecto de la aplicación del programa SQuI2 en la dependencia, el equilibrio, la capacidad de marcha, la fuerza muscular y el riesgo de caída de las personas mayores institucionalizadas en una residencia de la región norte.

Metodología: Estudio cuasi-experimental, muestra no probabilistica por conveniencia de ancianos institucionalizados (n=22). Dependencia, equilibrio, capacidad para caminar, fuerza muscular y riesgo de caídas fueron las variables

monitorizadas mensualmente durante 6 meses. Instrumentos: índice de Barthel; escalas de Berg, Holden y Morse; y Medical Research Council Modificada.

Resultados: Se observaron cambios estadísticamente significativos: una reducción de la dependencia (37,5 vs. 65,0; p<0,001); aumento del equilibrio (4,0 vs. 26,5; p<0,001), de la capacidad para caminar (0,0 vs. 3,0; p<0,001) y de la fuerza muscular (4,0 vs. 5,0; p<0,001).

Discusión: El SQuI2 permitía una menor dependencia para caminar y realizar las actividades de la vida diaria. Aumentaba el riesgo de caídas cuando los ancianos intentaban caminar.

Conclusión: El SQuI2 mejoró el nivel de dependencia, el equilibrio, la capacidad para caminar y la fuerza muscular, pero no tuvo efectos estadísticamente significativos sobre el riesgo de caídas. Este estudio permite replantearse el envejecimiento y los modelos tradicionales de ERPI. También aporta pruebas científicas para una práctica más específica, reforzando la eficacia del SQuI2 y el papel fundamental del enfermero de rehabilitación en la mejora de la autonomía de los ancianos institucionalizados.

Descriptores: Accidentes por Caídas; Enfermería en Rehabilitación; Equilibrio Postural; Fuerza Muscular; Independencia Funcional; Marcha.

INTRODUCTION

In the 2021 Census, the population aged 65 and older represented 23.4% of people living in Portugal, and this trend will not be reversed; everything indicates that it will increase[1]. These projections also predict that the share of the population aged 65 and over will be 36.8% in 2080. As we witness a society with more seniors and longer-lived people, a society with more specific needs for this age group will emerge.

An elderly person is any individual aged 60 or older[2], and it is important to consider that chronological age is not an accurate marker for the changes that accompany aging. Among the main structural and physiological changes resulting from the aging process, the most notable are changes in mobility, posture, sensory systems and diet/nutrition[3]. The changes in mobility and posture mentioned above have consequences that impact the lives of the seniors, compromising their active role in society. There is also a decrease in muscle mass and bone fragility, with consequent impairment of balance and, in turn, walking ability[3]. The reduced levels of physical activity that often accompany this phase of life are associated with a reduction in muscle strength accompanied by signs of sarcopenia and atrophy. It is estimated that 20 to 40% of maximum strength is lost by the age of 65 in sedentary elderly individuals. Elderly individuals with decreased strength in the dorsiflexor muscles of the ankle, hip extensors and knee extensors have a four times greater risk of suffering a fall[4]. These changes, combined with other factors such as poor lighting, slippery floors, loose or folded carpets, polymedication and inappropriate orthoses/walking aids, increase the likelihood of falls in elderly individuals[5]. Fall events are defined as situations in which the individual unexpectedly ends up on the ground or at a lower level, excluding situations in which they intentionally change position[6], representing one of the greatest global public health problems related to elderly individuals nowadays[7]. When they do not lead to death, falls can reduce functional capacity and independence, harming their quality of life, in addition to incurring hospitalization costs[8]. Approximately 1 in 3 elderly people over 65 years-old suffers at least one fall each year, and the prevalence of events increases gradually, reaching 50% after the age of 80, and is higher in women[9]. Evidence shows that 55% of fall episodes are related to gait changes, the latter being characterized by a rhythmic movement that keeps the body in progressive locomotion. This movement consists of the combination of the interaction between balance and external forces acting on the body, and the response of internal forces coming from the human neuro-musculoskeletal system. Gait also depends on the neurological, vestibular and cardiovascular systems, which are also affected with aging[10]. Elderly people are also prone to losing the normal swing of their arms, and to decreasing walking speed, step length, stride and cadence[11]. All these changes have an influence on dependence and ability to walk (ineffective, requiring supervision or autonomous).

The main cause of institutionalization of seniors is dependence in Activities of Daily Living (ADLs), and it is also evident that the need for health care is strongly associated with the person's transition after an event that generates dependence (such as falls and their consequences), as well as with the competence of the person and their family members to manage their care[12]. In turn, for this study, institutionalization is understood as comprehensive care, in a boarding regime, for people aged 60 or over (adults under 65 years old, in duly justified exceptional situations and specific situations due to the absence, impediment or need for rest of the caregiver), dependent or independent, with or without family ties and/or who do not have the conditions to provide for their own subsistence. Residential Facilities for the Elderly Individuals (RFEI) must meet the needs of these elderly individuals in terms of housing, food, health and social interaction, through the work of social assistance, medicine, psychology, nursing, physiotherapy, occupational therapy, dentistry, nutrition, among other services[13]. The institutionalization of the elders in RFEI represents a risk factor for falls, since the change from the familiar environment to a strange environment can predispose to psychological, cognitive

and functional changes related to isolation, abandonment and physical inactivity of the individual, leading to increased dependence to perform Activities of Daily Living (ADL), and consequent reduction in functional capacity[14]. Considering that falls occur as a result of a complex interaction between factors[15] and that it is of fundamental importance to plan interventions aimed at their prevention in the elderly population, it is necessary to demonstrate the contribution of the Specialist Nurse in Rehabilitation Nursing (SNRN) in this regard. The specific skills assigned to the SNRN allow it to make decisions regarding health promotion, prevention of secondary complications, treatment and rehabilitation, maximizing the person's potential[16].

With regard to daily physical activity, this improves physical performance and reduces the risk of falls in the elderly population[4]. This fact is also corroborated by authors[17], who demonstrate the reduction of falls through muscle strengthening and balance programs, which is why they suggest their implementation at community level. There is a wealth of national and international evidence supporting the beneficial effects of balance training, such as: reducing the fear of falling; reducing the number of falls; improving balance performance; improving gait execution; and the resulting increase in quality of life[18–22].

Thus, the SNRN is capable of implementing a rehabilitation program that aims to maintain and maximize the functional capacities of seniors in ADL (eating, personal hygiene, using the toilet, bathing, dressing and undressing, sphincter control, walking, transfers, going up and down stairs), by working on components such as balance, muscle strength and coordination, with a view to the greatest possible independence of the elderly, thus contributing to the prevention of falls. Therefore, the "Stop Quedas Idosos Institucionalizados" (SQuI2) program was created. Therefore, the following research question was developed: "*What is the effect of applying the SQuI2 program on dependence, balance, walking ability, muscle strength and risk of falling in elderly people institutionalized in an ERPI in the North region?*", outlining the following aim *"To evaluate the effect of applying the SQuI2 program on dependence, balance, walking ability, muscle strength and risk of falling in elderly people institutionalized in an ERPI in the North region"* and structuring the following hypothesis *"There is a positive effect in applying the SQuI2 program on dependence, balance, walking ability, muscle strength and risk of falling in elderly people institutionalized in an RFEI in the North region*".

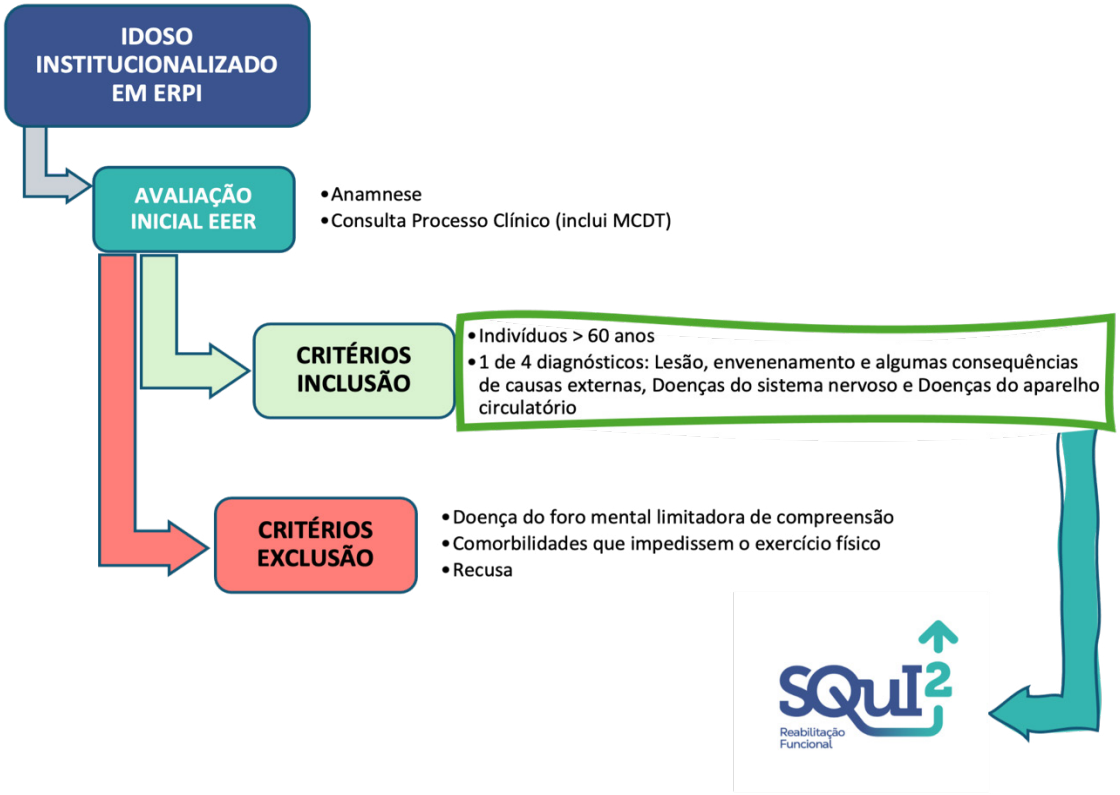
METHODOLOGY

This is a single-group quasi-experimental study. The study took place in an RFEI in northern Portugal, from September 2023 to February 2024. The sample consisted of institutionalized elderly people (n = 22) from that same RFEI, having been selected by the non-probabilistic convenience sampling method. The inclusion criteria were: individuals over 60 years old, institutionalized and with one of the four main diagnoses according to the International Classification of Diseases 10th edition: Injury, poisoning and some consequences of external causes (e.g., limb fractures, traumatic brain injury and disuse myopathy), Diseases of the nervous system (e.g., Parkinson's), Mental and behavioral disorders (e.g., progressive supranuclear palsy) and Diseases of the circulatory system (e.g., stroke). The exclusion criteria were: individuals with mental illness that limited the understanding of the object of study, as well as the content of the program sessions; or with comorbidities that prevented physical exercise; or even those who simply refused to join the program.

The elderly individuals participating in the study were recruited by obtaining a list of all users assigned to the RFEI, in a computerized clinical record. Subsequently, the selection process was initiated based on the aforementioned inclusion criteria and an informed consent document was prepared for voluntary signature by the participants. The initial data collection was carried out through anamnesis and consultation of the clinical file, and the data were coded and processed in such a way that it was impossible to identify the participants. The study was carried out within the work context of an SNRN, the only one in its institution, with the practical component of SQuI2 being exclusively applied by the same, reducing the possibility of bias, with the knowledge and approval of the management of the institution involved. Regarding ethical issues, this study obtained the mandatory institutional authorizations (confidentiality, anonymity, integrity, beneficence and non-maleficence) and received a favorable opinion from the National Ethics Committee for Clinical Research (CEIC), under the provisions of Article 35, paragraph 2 d), based on the elements referred to in Article 16, paragraph 6 of Law No. 21/2014 of April 16.

SQuI2 was structured based on the guidelines of the Otago Exercise Program – a falls reduction program[18], however, with some differences. The primary aim is common, that is, to reduce falls in the elderly through an exercise program that develops balance and muscle strength. The development of this type of program (Otago and SQuI2) increases the percentage of elderly people who can live more independently in their daily lives. On the other hand, while the Otago program is applied in the elderly person's own home for 52 weeks and is monitored remotely by a physiotherapist, the SQuI2 was applied exclusively to institutionalized elderly people in RFEI, for 24 weeks, and was monitored by an SNRN present in all sessions.

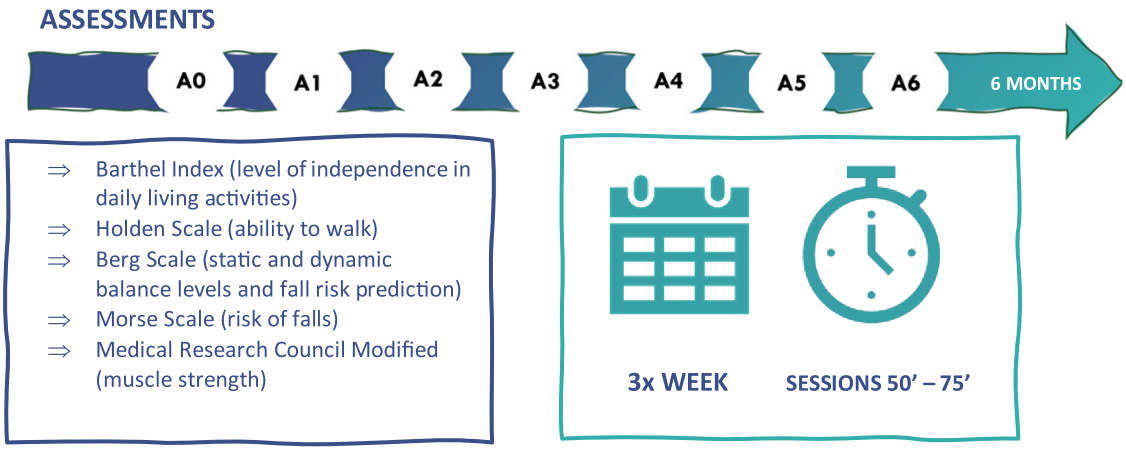
Figure 1 - SQuI2 Application Flowchart



This program allowed real-time adaptations to the guidelines recommended for each session, that is, given the elderly person's mood, motivation, and predisposition for the session/exercise, the SNRN was able to adapt the session/exercise. Physical exercise programs implemented with elderly people must be structured and adapted to their specific condition, which changes daily, by readjusting the volume and intensity of the exercises[23]. According to these authors, guided, structured and supervised physical exercise represents one of the best strategies for preserving the levels of functionality and independence of elderly people. Another difference is that the Otago program only emphasizes exercises to strengthen the lower limbs, while the SQuI2 also includes exercises for the upper limbs and trunk. To reinforce the importance of this difference between the programs, it was considered that the balance of the upper limbs not only stabilizes the gait, but also, the recovery of the upper limbs helps in the recovery of gait stability after a disturbance[24]. The SQuI2 was applied for 6 months, with intervention 3 times a week (72 sessions in total) and lasting 50-75 minutes. The duration of each session varied depending on the person's capacity and tolerance, with an average of 1 hour of intervention per day. Each session was divided into three parts: 5 to 10 minutes of warm-up, 35 to 40 minutes of specific training (including 10 to 15 minutes of aerobic exercise, 10 to 15 minutes of strength training, 10 to 15 minutes of coordination/balance training) and finally 5 to 10 minutes of cooling down with breathing and stretching exercises. The sessions included simple, varied and easy-to-understand tasks so that the elderly could understand the movements and perform them as best as possible, within their limitations[23].

Seven assessment moments were carried out for each elderly person: the initial assessment on the first day; 5 intermediate assessments at the end of each month; and the final assessment in the last session. The rehabilitation nursing assessment was carried out through the collection of data from the clinical process (including Complementary Diagnostic Means), informal interview, direct observation and application of the following assessment instruments: Barthel Index[25] to identify the level of dependence in ADL, Holden Scale[26] for functional gait classification, Berg Scale[27] for balance assessment, Morse Falls Scale[28] to assess the risk of falls and Modified Medical Research Council[29] to monitor limb muscle strength. The results were monitored, recorded according to the days of the sessions and are shown in the results.

Figure 2 - Timescale of SQuI2 application



Within the scope of the application of SQuI2, nursing diagnoses and interventions can be identified, based on the documentary standard of Nursing care in the Rehabilitation Nursing Specialty[30], demonstrated in the table below.

Chart 1 - Nursing Diagnoses and Interventions in Rehabilitation

Focus	Nursing diagnosis	Nursing interventions
MOVEMENT	Decreased muscle movement	• To perform active-assisted muscle and joint exercise technique; • To perform active resisted muscle and joint exercise technique; • To perform passive muscle and joint exercise technique; • To perform passive muscle and joint exercise technique with an auxiliary device; • To encourage the person to perform active muscle and joint exercises: Self-mobilization; • To monitor muscle strength using a scale [Modified Medical Research Council]; • To supervise muscle movement.
	Potential to improve knowledge about muscle and joint exercise techniques	• To assess knowledge about muscle and joint exercise techniques; • To teach about muscle and joint exercise techniques; • To provide educational material.
	Potential to improve ability to perform muscle and joint exercise techniques	• To assess the ability to perform muscle and joint exercise techniques; • To provide instruction on muscle and joint exercise techniques: ‣ Self-mobilization; ‣ Assisted active mobilizations; ‣ Active mobilizations; ‣ Resisted active mobilizations; ‣ Squat exercises; ‣ Muscle strengthening exercises; ‣ Fine motor skills exercises; • To train muscle and joint exercise techniques.

Focus	Nursing diagnosis	Nursing interventions
BODY BALANCE	Compromised balance	• To assess body balance; • To apply an auxiliary device; • To encourage maintaining body balance: Postural Correction; • To perform balance training techniques: ‣ Alternating load on upper and lower limbs; ‣ Single-leg support; ‣ Going around obstacles; ‣ Movement coordination exercises; ‣ Cross-facilitation; • To monitor body balance using a [Berg] scale; • To provide guidance on balance training techniques.
	Potential to improve knowledge of balance training technique	• To assess the ability to perform body balance techniques; • To provide instruction on body balance techniques: ‣ Postural correction; ‣ Static balance while sitting and standing; ‣ Dynamic balance while sitting and standing; • To train body balance techniques.
	Potential to improve ability to use body balance technique	• To assess knowledge about body balance technique; • To teach about body balance technique; • To provide educational material.

In addition to the planned nursing interventions, a training plan was defined for SQuI2 to enhance the results. Two exercise groups were defined: balance/coordination exercises and muscle strengthening exercises. Within the balance/coordination exercises, the following stood out: single-leg support with or without support, lateral walking with or without support, obstacle walking, "walking in figure 8" (walk and turn), walking backwards with or without support, standing up/sitting down with or without support, walking on tiptoes (toe walking), climbing up/down steps with or without support, climbing up/down stairs with or without support and dual task exercise. Regarding muscle strengthening exercises, the following were used: Seated lower leg extension, Standing lower leg flexion, Standing lower leg abduction, Plantar flexion, Plantar dorsiflexion, forward trunk flexion, deadlift, gluteal bridge, squat with support; shoulder flexion, shoulder abduction, elbow flexion, elbow extension, lying bench press, dorsal row. Individual perception of effort was monitored using the Modified Borg scale[31] and allowed adjustment of the duration of sessions and each exercise, the progression of the load and the rest time. Therefore, below is an example of a session plan that included muscle strengthening and balance/coordination training.

Chart 2 - Example of a SQuI2 session plan

EXAMPLE OF SESSION		
Components	**Exercises proposed**	**Time**
INITIAL **Heating**	Passive/Active Mobilization (non-resisted) Polyarticular: Neck, Shoulders, Elbows, Hips and Knees.	5 to 10 min

EXAMPLE OF SESSION		
Components	**Exercises proposed**	**Time**
FUNDAMENTAL **Specific** **Training**	Aerobic Exercise – Cycle Ergometer [Lower Limbs (LL) or Upper Limbs (UL)]; Strength: • 3 sets of 10 repetitions, with a 30-second break between sets; • External load (dumbbells, ankle weights, sticks, elastic bands, etc.); - Seated LL Extension; - Standing LL Flexion; - Standing LL Abduction; - Plantar Flexion. Coordination/Balance: • For isometric exercise – sets of 20 to 30 seconds, with a 30- to 45-second break between sets; • For the remaining exercises, 3 sets of 10 repetitions, with a 30-second break between sets; - 90º LL elevation with support (isometry); - Lateral Walk with support; - Stand/Sit with/without support (capacity of the elderly); - Walking without support.	10 to 15 min 10 to 15 min 10 to 15 min
FINAL **Return to calm** **Stretching**	STRETCHING: - MS and LL (flexion, extension and abduction); - Trunk (lateral flexion); - Cervical (lateral and frontal flexion); BREATHING: Normalization of heart and respiratory rate, before leaving the session: - Breathing Awareness; - Dissociation of Respiratory Times; - Diaphragmatic Breathing (half-closed lips).	5 to 10 min

For statistical analysis of data, the IBM SPSS Statistics version 26 program was used. For quantitative variables, means, standard deviations, medians, 25th and 75th percentiles, minimum and maximum values were calculated. For qualitative variables, absolute frequencies (n) and relative frequencies (%) were calculated. For inferential analyses, given the nature of the variables used, the Friedman test was used. A significance level (α) of 0.05 was used for all data analyses.

RESULTS

SAMPLE CHARACTERIZATION

The convenience sample, composed of 22 elderly people, has an average age of 79.68±9.27 (min: 60 years old; max: 91 years old), of which females make up 86.4% of the sample and Injury, poisoning and some consequences of external causes (e.g. fractures of the lower limbs) corresponds to 45.5% of the sample.

Table 1 – Sample charactetization

Variable		n (%)
Gender	Female	19 (86.4)
	Male	3 (13.6)
Principal diagnosis (International Classification of Diseases 10th edition)	Injury, poisoning and some consequences of external causes	10 (45.5)
	Diseases of the nervous system	7 (31.8)
	Mental and behavioural disorders	3 (13.6)
	Diseases of the circulatory system	2 (9.1)

Regarding falls, it was observed in the initial assessment prior to the application of SQuI2 that 27.3% had 1 fall, 22.7% had no falls and 18.2% had 2 and 3 falls.

LEVEL OF INDEPENDENCE IN DAILY LIVING ACTIVITIES

Considering table 2, a significant difference can be observed in the evolution of the seniors throughout the rehabilitation nursing program (37.5 - severely dependent; 65.0 - mildly dependent; p<0.001).

Table 2 - Barthel Index of the elderly during the application of SQuI2

	Minimum	Maximum	Percentiles			p-value
			25º.	50º (Median)	75º	
BarthelA0	10.00	85.00	25.0000	37.5000	60.0000	<0.001
BarthelA1	10.00	85.00	33.7500	52.5000	60.0000	
BartelA2	0.00	85.00	40.0000	55.0000	65.0000	
BarthelA3	0.00	100.00	43.7500	60.0000	70.0000	
BarthelA4	0.00	100.00	50.0000	62.5000	75.0000	
BarthelA5	0.00	100.00	53.7500	65.0000	75.0000	
BarthelA6	0.00	100.00	50.0000	65.0000	7.62500	

STATIC AND DYNAMIC BALANCE LEVELS AND FALL RISK PREDICTION

Observing table 3, a statistically significant evolution was observed in the level of balance throughout the aforementioned program [4.0 - 100% current risk of falling, with the elderly person already able to walk in a wheelchair; 26.5 - 100% current risk of falling, with the elderly person requiring assistance in walking (material or human); p<0.001].

Table 3 - Berg Index of the elderly during the application of SQuI2

	Miminum	Maximum	25º.	50º (Median)	75º	p-value
BergA0	0.00	41.00	3.0000	4.0000	30.0000	
BergA1	1.00	43.00	5.7500	12.0000	31.5000	
BergA2	0.00	43.00	11.0000	16.5000	33.7500	
BergA3	0.00	47.00	13.7500	23.0000	36.0000	<0.001
BergA4	0.00	49.00	15.7500	22.0000	36.0000	
BergA5	0.00	50.00	19.5000	24.5000	39.0000	
BergA6	0.00	50.00	23.5000	26.5000	41.0000	

ABILITY TO WALK

By observing table 4, a significant improvement was observed in the gait of the elderly people under study (0.00 – ineffective gait; 3.00 – dependent gait with supervision; p<0.001).

Table 4 - Holden Scale throughout the application of SQuI2

	Minimum	Maximum	25º.	50º (Median)	75º	p-value
HoldenA0	0.00	4.00	0.0000	0.0000	2.2500	
HoldenA1	0.00	4.00	0.0000	1.0000	2.0000	
HoldenA2	0.00	4.00	1.0000	2.0000	3.0000	
HoldenA3	0.00	4.00	1.0000	2.0000	3.0000	<0.001
HoldenA4	0.00	4.00	1.7500	2.0000	3.0000	
HoldenA5	0.00	5.00	2.0000	3.0000	3.2500	
HoldenA6	0.00	5.00	2.7500	3.0000	4.0000	

RISK OF FALLS

No significant relationship was observed in the difference in medians throughout the program (45 vs. 50 – high risk), as can be seen in Table 5.

Table 5 - Morse scale throughout the application of SQuI2

	Minimum	Maximum	Percentiles			p-value
			25º.	50º (Median)	75º	
MorseA0	15.00	80.00	38.7500	45.0000	60.0000	0.931
MorseA1	15.00	80.00	33.7500	50.0000	61.2500	
MorseA2	15.00	80.00	33.7500	50.0000	56.2500	
MorseA3	15.00	80.00	35.0000	50.0000	56.2500	
MorseA4	15.00	80.00	30.0000	50.0000	60.0000	
MorseA5	15.00	80.00	30.0000	50.0000	56.2500	
MorseA6	25.00	80.00	30.0000	50.0000	56.2500	

MUSCLE STRENGTH

A significant relationship was observed in the difference in medians throughout the program (4.5 vs. 5.0 – complete mobility; p<0.001), as can be seen in table 6.

Table 6 - Medical Research Council Modified throughout the application of SQuI2

	Minimum	Maximum	Percentiles			p-value
			25º.	50º (Median)	75º	
MRCA0	2.50	5.00	4.0000	4.5000	5.0000	<0.001
MRCA1	3.25	5.00	4.1875	4.5000	5.0000	
MRCA2	3.25	5.00	4.5000	5.0000	5.000	
MRCA3	2.75	5.00	4.5000	5.0000	5.0000	
MRCA4	3.50	5.00	4.8750	5.0000	5.0000	
MRCA5	3.75	5.00	5.0000	5.0000	5.0000	
MRCA6	4.00	5.00	5.0000	5.0000	5.0000	

DISCUSSION

Through this study, it was possible to observe that with the application of SQuI2 there was a statistically significant decrease in the degree of dependence of institutionalized elderly people and a statistically significant increase in their balance, walking ability and muscle strength. The evolution is significant in monitoring the degree of dependence throughout the evaluations, a fact that can be explained by notable improvements in

measurable aspects on the scale used, namely, the ability to assist in transfers, the decrease in dependence in going to the toilet and the decrease in dependence in walking. The rehabilitation sessions aimed, among other aspects, at muscle strengthening and balance training. The gains in these components were positively reflected in the aforementioned ADLs. It should be noted that, although it was not the direct focus of the rehabilitation sessions, the degree of dependence in the various ADLs tended to improve significantly. By feeling that they are becoming more independent in walking, transfers and with more strength in their upper and lower limbs, institutionalized elderly people increased their motivation for the remaining ADLs, which was in line with what has already been studied by other authors. For example, getting dressed, eating or personal hygiene are some ADLs in which the motivation of the elderly person to perform them (within their limitations) is crucial[32].

The evolution in muscle strengthening and balance has made the elderly person less dependent on their walking. As can be inferred from the results, a large proportion of elderly people move from walking in a wheelchair to walking with assistance (material, human or both). It has often been witnessed that the transition from walking in a wheelchair to walking (even with human assistance or a walking aid) represents a significant increase in the risk of falling. For this reason, there is an imperative need for this type of program to be implemented by an SNRN, an author capable of assessing and choosing the most appropriate form of walking. The findings of this study are in line with what is described in the Good Practice Guidelines - Care for people with mobility impairments - positioning, transfers and walking training, written by members of the Board of the College of Rehabilitation Nursing Specialty. It is essential not to forget that walking aids should be selected based on the clinical situation, age and degree of dependence and are exclusive to each elderly person and should not be shared. In addition to ensuring the individuality of each elderly person, the SNRN is also responsible for ensuring the safety of the environment, checking that the floor is clean and dry, without barriers that hinder walking and that the rubber of the walking aids is intact[33]. Factors such as the use of closed footwear with good support and non-slip soles are also crucial, so that a greater risk of falls due to the elderly now walking is not seen as an obstacle to their greater condition of autonomy. If, in addition to the application of a wide range of SNRN skills applicable in the context of RFEI, we add greater supervision of walking in institutions and the implementation of muscle strengthening and balance training programs such as SQuI2, which in turn respond to the physiological setbacks of aging described as making elderly people more prone to falling episodes, it is possible to evolve from ineffective walking to more autonomous walking levels, even if walking aids are necessary, significantly reducing the number of falls[34].

There are also other facts raised by international studies that are important to highlight, since SQuI2 can be considered a rehabilitation nursing program that involves physical exercise. Several authors corroborate that physical exercise improves sensorimotor and somatosensory functions, resulting in better proprioception20. This study adds that physical exercise programs carried out for at least 12 weeks in elderly people improve postural stability and reduce the occurrence of falls. The results after applying the SQuI2, which in turn was carried out for 24 weeks, reiterate the consistency of this same international study, which argues that resistance training and aerobic training have beneficial effects on muscle strengthening in the elders, particularly with the use of elastic bands[20]. The literature also reinforces that balance exercises help to train the center of pressure and center of mass and, consequently, improve postural oscillation and stability in the elderly, reducing the likelihood of falling episodes[35].

Balance is a key component of many of the elderly's daily activities, and its improvement translates into less dependence and better physical condition[18], as SQuI2 can reinforce. In addition to this fact, it is important to highlight a study that relates cognitive improvements to improvements in balance, with the most plausible justification being the fact that the neural networks of these two components share the same path in the nervous system[36]. A smaller volume of cerebral gray matter was associated not only with poorer cognition, but also with greater postural instability. This same study reinforced that resistance and balance training have the potential to prevent or delay declines in cognitive functions associated with aging, so it is possible to infer that SQuI2 has the potential to improve cognitive function, since it includes this type of training in its application, and effectively improves balance, as can be inferred from the results.

It should be noted that during the application of SQuI2 in this group of institutionalized elderly people, there were no injuries or exacerbations of their existing conditions to be recorded.

The limitations of this study include: geographical restriction, the fact that it only addressed one institution, the lack of a control group for comparison (a group of institutionalized elderly individuals in the same institution who were not targeted by SQuI2), the fact that the program was not subject to expert evaluation, and the lack of randomization in the sample selection (which may have introduced selection biases, since the selection process did not ensure that the group was completely representative of the population of institutionalized elderly individuals). Additionally,

external factors, such as variations in medication and social and psychological components, were not controlled, which may have influenced the results and limited the internal validity of the study. External validity also faces restrictions, given that the results obtained with this sample of 22 elderly individuals from a single institution may not be directly applicable to other populations or contexts. Regional, organizational or cultural differences may impact the replicability of the program in institutions with different characteristics.

CONCLUSION

This study demonstrates the ability of SQuI2 to improve the level of dependence, balance, walking ability and muscle strength of institutionalized elderly people. However, SQuI2 did not demonstrate a significant effect on the risk of falls.

It would be essential and imperative in future research to evaluate the risk factors for the occurrence of falls, particularly in the institutionalized elderly population. Given that this is a population with such specific characteristics, it is important to evaluate the possibility of creating Fall Risk scales for specific populations, with attention to factors such as fractures/surgical interventions resulting from fractures, gender, risk of falls associated with the use of different walking aids (cane, tripod or walker with/without wheels). The aim is also to validate SQuI2 for a more focused, specific and targeted rehabilitation nursing practice, in this case in the prevention of falls in institutionalized elderly people.

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Formal analysis: ARN, ARM, LTA
Investigation: ARN
Methodology: ARN, ARM, LTA
Project administration: ARN, ARM, LTA
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