Training Contributions of Executive Functions in Perception of Quality of Life in Elderly

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Authors' contributions

This work was carried out in collaboration between both authors. The author RMFL conducted any research. Author IIDLA held the orientation of research. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: Verify the presence or lack of improvement in quality of life perception, comparing the results of the evaluation from both elderly groups that participated on the executive functions training research.
Study Design: This is a quantitative, quasi-experimental, correlational study, with pre- and post-tests and intervention, with a control group for comparing.
Place and Duration of Study: Program of Graduate Studies in Psychology (PUCRS), between April 2013 and September 2013.
Methodology: 145 participants, all over 60 years old. Instruments: a battery of neuropsychological evaluations of cognitive functions, and the WHOQOL-OLD and WHOQOL-BREF, before and after cognitive testing. The participants from the experimental group participated in eight sessions of cognitive training (CT). 83 subjects agreed to participate in the research, 16 men (19.3 percent) and 67 women (80.7 percent). They were divided into a Control Group (CG, n=38) and an Experimental Group (EG, n=45).

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Results: Comparing the results between groups, there was a significant difference in the scores related to quality of life, especially in the Past-Present-Future activity of the WHOQOL-OLD (p=0.025). The EG participants increased their score significantly in this domain when compared to the CG. The EG had significant improvement in the Past-Present-Future activity of the WHOQOL-OLD (p=0.002) and in total score (p=0.014). The CG had significant improvement in the total score of the WHOQOL-BREF (p=0.041).

Conclusion: The training of executive functions utilizing the program named above contributed for the improvement of life quality in elders.

1. INTRODUCTION

Well-being is the capacity for functioning ideally. It includes not only physical health, but also a sense of interest in one is own environment, the confidence to be able to plan and act to achieve goals, and the energy and motivation to be able to keep going when obstacles emerge. Thus, well-being allows people to keep their vitality and prosper in an ecological environment every day [1]. The term "Quality of Life" is described as the degree to which people perceive themselves as capable of functioning physically, emotionally, mentally, and socially. In a more quantitative sense, it can be considered as an estimation of the time left of a life free of deficiency or incapacitation. It is like the saying goes: Quality of life adjusted to the years of life to come [2].

Quality of life and cognitive aspects relate to one another because people who suffer from a decline of cognitive functions may perceive their quality of life as lessened [3]. The study mentions were pioneers in demonstrating the independent association between chief executives processes measured by standardized neuropsychological tests, using an instrument of quality of life. This independent association was found in a group of elderly women, after assessing their age, co morbidity index, general mobility, and global cognition. Thus, according to the same author, cognition is a multidimensional construct and executive functions may be of particular importance for the quality of life. Executive functions are higher-order cognitive processes which control planning, initiative, sequencing, and the management of complex goal directed behaviour. In this way, cognitive processes are essential for people to be able to have health-promoting behaviors such as changing their diet and lifestyle, managing medications, self-monitoring vital responses, and seeing a physician regularly [3].

Thus, through an extensive literature review, we recommend that the many techniques which are used be divided into three groups: Neuropsychological Rehabilitation, Cognitive Stimulation, and Cognitive Training [4]. Neuropsychological Rehabilitation (NR) seems to be a more comprehensive nomenclature, because it comprehends psychotherapy techniques, family guidance, therapeutic environments, cognitive rehabilitation, and the education of the patients [5]. It deals with cognitive difficulties and emotional responses in an integrated way; it considers the social context and previous knowledge of the patient [4]. The NR allow people with cognitive incapacities, emotional or compartmental deficits to reach their maximum in the social, psychological, recreational, professional or day to day functioning areas. The same author mentions rehabilitation with a holistic focus, that is more efficient, and defines it is approach as the one that recognizes the fact cognition, emotion and behavior are dynamically linked. Therefore, in the rehabilitation of brain injuries all these functions must be approached as an integrated matter by an interdisciplinary team [6]. Primarily, it is necessary an appropriated intervention and a neuropsychological functioning mapping, with the goal of investigating cognitive strengths and weaknesses on the patient, so a NR program can be developed.

Cognitive Stimulation (CS) is the first cognitive intervention done in patients with AD. It is based on Reality Orientation Therapy, and its objective is to lessen confusion and disorientation. It can be performed in groups with 30-minute classes that can be administered daily. It uses social interactions to show data from reality in an informal and continuous way [7]. Cognitive Training (TC) claims that when one specific function is exercised it is possible to improve global functioning. It is a practice oriented by an array of tasks and simulations of daily activities

through multiple strategies. The tasks ask the person receiving the training to use cognitive functions, such as attention, executive functions, memory, and language [8].

The influence of CT in the elderly has been proven, but the influence of CT on their perceived quality of life has not yet been proven. Thus, this subject has not been studied enough, which can indicate a new important parameter in the evaluation of the efficiency of CT – that is, a way of measuring the effects of CT by the perception of quality of life. In addition to these data, maintaining the cognitive health of the elderly is of vital importance for the quality of life and well-being of this population. These perceptions of quality of life and well-being may be achieved with programs for the prevention of cognitive decline, which can slow down the appearance of dementia. Activities demand concentration, reasoning and attention promote an increase in brain synapses which are responsible for brain plasticity. Besides, they help in the recovery of cognitive functions, since it influences functional and neural plasticity. In view of these facts, early participation in CT and intellectual activities should be considered essential when treating the elderly. Keeping them mentally active, with time for leisure, also helps in preventing the decline of cognitive functions [9].

In face of the mentioned justifications, the study is significant because, to achieve a better quality of life in old age, cognitive functions should be preserved. Can slow the process of cognitive aging through training. Also, integrated in cognitive functions, the term "executive function (EF)" is considered relatively new in neuroscience. It comes from the observation of prefrontal areas of the brain which are involved in cognitive strategies such as: planning, working memory, solving problems, forming concepts. These strategies were called "executive functions". This work complements the line of study of the research group called "Evaluation and Intervention of the Vital Cycle", which studies cognitive aging, loss of cognitive abilities, and possibilities of intervention. The hypothesis is that quality of life perceptions of elders could be improved by the training of executive functions.

2. MATERIALS AND METHODS

This is a quantitative, quasi-experimental, correlational study, with pre- and post-tests and intervention, with a control group for comparing.

The dependent variables are the scores of each test, and the independent variable is the age of the participants. No probability, convenience sampling was chosen for this study with participants from the community who were socially active and independent.

2.1 Participants

The search have 145 elderlies were invited to participate in the study, selected by convenience. They were all over 60 and lived in the community. 83 subjects agreed to participate in the complete research, and were divided into a Control Group (CG) and an Experimental Group (EG). The average age of the EG was 69.2 (sd = 6.1) – participants were 60 to 83years old. The average age of the CG was 68.3 (sd = 6.3) – participants were 60 to 81 years old. 16 participants were male (19.3 percent), and 67 were female (80.73 percent).

2.1.1 Inclusion criteria

Participants should be aged over 60 years old. They were capable of hearing and understanding the objectives of this research; they did not present major visual and/or hearing problems which could interfere in the tests; they accepted to participate in the study; in the Mini Mental State Examination (MMSE), they achieved a score of ≥ 18 points (elderlies with low/medium levels of education) or ≥ 26 points (subjects with high levels of education) [10]; they had a score of lower than 5 points in the Geriatric Depression Scale (GDS-15), and lower than 20 points in the Beck Anxiety Inventory (BAI) [11].

2.1.2 Exclusion criteria

Elderlies who presented sensorial deficiencies which prevented them from hearing or seeing; participants who presented a case of dementia and/or acute confusional state; motor deficiency or tremor in the dominant hand which impeded them from performing the writing and copying tasks; major diseases and/or other important aspects which could interfere in the research.

2.2 Instruments

Sociodemographic, semi-structured interview; Mini Mental State Examination (MMSE); Geriatric Depression Scale (GDS); Beck Anxiety Inventory (BAI). Instruments for the evaluation of the quality of life: WHOQOL-BREF and WHOQOL-OLD.

The Mini Mental State Examination (MMSE) is the most widely utilized cognitive screening test in the world [12]. It has been used in epidemiological population studies, and is present in many tests, It is score can vary from 0 to 30 points, with the established cutoof point of 24 [13].

One of the most used instruments for evaluating the quality of life is the WHOQOL-100, which consists in 100 questions referring to six domains: Physical, psychological, level of independence, social relationships, environment, and spirituality/religion/personal beliefs. Later, the WHOQOL Group researched and found the necessity for an instrument which could be applied briefly, and developed the WHOQOL-BREF, which is composed of 26 questions, is multidimensional, and evaluated the quality of life in general; it tests four main domains: Physical health, psychological health, socials relationships, and environment. According to [14-16], are the following the Domains and Facets of the:

2.2.1 WHOQOL-BREF

2.2.1.1 Physical Health domain (PH) - domain 1

Related to pain and discomfort, energy and fatigue, sleep and rest, mobility, activities of daily living, dependence on medicinal substances or medical aids, and work capacity (items 1, 2, 3, 9, 10, 11 and 12).

2.2.1.2 Psychological (PSY)- domain 2

Related to positive and negative feelings, thinking, learning, memory, and concentration, bodily image and appearance, self-esteem, and also to aspects concerning spirituality, religion and personal beliefs (items 4, 5, 6, 7, 8 and 24).

2.2.1.3 Social Relationships (SR) - domain 3

Related to personal relationships, social support, and sexual activity (items 13, 14 and 15).

2.2.1.4 Environment (ENV) - domain 4

Related to freedom, physical safety, and security, home environment, financial resources, health and social care: accessibility and quality. Also related to opportunities for acquiring new information and skills, participation in and opportunities for recreation and leisure activities, physical environment (pollution/noise/traffic /climate), and transport (items 16, 17, 18, 19, 20, 21, 22 and 23).

Understanding the need for instruments to evaluate the quality of life o folder adults, a research done by the World Health Organization developed an instrument for measuring the quality of life of the elderly, the WHOQOL-OLD, tested in several countries. This instrument is meant to be used in the elderly for identifying the quality of life of this population [17]. The WHOQOL-OLD module is composed of 24 items and a 5-point Likert report scale attributed to six facets or domains [15].

2.2.1.5 Sensory Abilities (SA) - domain 1

Evaluates sensory function, and the impact of the loss of sensory abilities on daily activities, and of the ability of interacting with other people on the quality of life of elderly people (items 1, 2, 10 and 20).

2.2.1.6 Autonomy (AUT) – domain 2

Related to independency in the elderly, evaluating to what extent they are capable of making their own decisions and living with autonomy (items 3, 4, 5 and 11);

2.2.1.7 Past, Present, and Future Activities (PPFA) - domain 3

Related to past, present, and future activities, concerning satisfaction about projects, aspirations for the future, and achievements (items 12, 13, 15 and 19).

2.2.1.8 Social Participation (SP) - domain 4

Related to social participation, that is, participation in daily activities, especially in the community where the elderly person lives (items 14, 16, 17 and 18).

2.2.1.9 Death and Dying (DD) - domain 5

Related to worries, expectations, uneasiness, and fears about death and dying (items 6, 7, 8 and 9).

2.2.1.10 Intimacy (INT) – domain 6

Measures the capacity for maintaining personal and intimate relationships. Relates to the intimacy of the elderly (items 21, 22, 23 and 24).

2.2.2 Mini Mental State Examination (MMSE)

Developed by [18], and validated in Brazil by [10]. It contains questions grouped into seven categories: Orientation to time, orientation to place, registration of three words, attention and calculation, recalling three words, language, and visual constructive ability. The points may vary from a minimum of zero to a total of 30 points, but the established cutoff point is 24 [13].

2.2.3 Beck Anxiety Inventory (BAI)

The goal of this test is to measure degrees of anxiety symptoms using a scale. The scale is composed of 21 items people evaluate according to the symptoms they are feeling, in a scale of intensity of up to four points. The results are measured by adding the points from each question. The cutoff points for the psychiatric population, according to the rules of the Brazilian version, researched in 1999 by [19], are subdivided in: 0 to 10 = minimum; 11 to 19= low; 20 to 30 = moderate; 31 to 63 = high [20,11].

2.2.4 Geriatric Depression Scale (GDS)

The original version of the GDS is composed of 30 dichotomous closed-end questions. In this study, for measuring the degree of depression symptoms in the elderlies before and after the interventions, we used the GDS-15, validated by [21]. This is a 15-question questionnaire with two options of answers: Yes and no. The results are found by adding the points. Anything lower than 5 is considered normal; 5 to 10 points indicate mild to moderate depression; and a result higher than 10 points indicates severe depression.

2.3 Data Collection Procedures

Initial contact was done with third age groups and retirement groups for explaining the research and inviting them to participate. At the same time, the snowball methodology [22] was used, and ads in two community newspapers were put up for finding patients. When they made contact, times and dates for the application of the instruments were scheduled, and also the sessions of Cognitive Training (CT).

According to their score in the pre-tests (instruments and sociodemographic interview), the elderlies were randomly assembled into groups of 10 for participating in the training. The first participats to apply were assigned to the Experimental Group (EG); when that sample was complete, the next subjects were assigned to the Control Group (CG), and did not receive CT. Both the EG and the CG participated in the post-test 60 days after the pre-test was done. After that, it was agreed that the elderlies would get the results. Two application protocols were drawn up, the Protocol A and Protocol B, where the order of application of instruments was reversed, with the aim of controlling the variable tiredness. The research was done in a neuropsychology clinic, in phases, divided in:

2.3.1 Phase 1

First contact with the patients, explanation of the research and signing of the Free and Clarified Consent Term. The interviews were done and the instruments were applied in this order: MMSE, GDS-15, BAI, and WHOQOL-OLD. After that, elderlies were included or excluded according to the inclusion/exclusion criteria.

2.3.2 Phase 2

Elderlies from the Experimental Group (EG) participated in training sessions. There were eight sessions of intervention, based on the studies by [23], about the EF, [24; 25]. This study had more emphasis on the EF and quality of life, which were the main subjects of this research. The eight sessions were divided into four sessions of EF training – which involved attention, working memory, planning, and making decisions -, and four more sessions focused on memory training. The sessions were administered by therapists and psychology students who were trained specifically for this. The sessions were done once a week, lasting 90 minutes each. A protocol of application was used to guide both the evaluation and the training phases.

2.3.3 Phase 3

The post-test was applied about a week after the last training session, for the EG. The CG participated in the post-test 60 days after the pre-test, but not in the training sessions. The same instruments used in the pre-test were used in the post-test.

In the first phase, in the pre-test, 145 elderlies were evaluated, 98 were assigned to the EG, and 47 to the CG. However, after a loss of sampling, 45 subjects were in the EG, and 38 in the CG. The program of eight sessions of memory and cognitive training [24,25], are described as follows:

Chart 1. Content of the cognitive training sessions

Sessions and functions	Strategies for the training of executive functions
Executive functions 1st Session:	1.1 Presentation of the research. 1.2 Lecture with opportunity for discussion: executive function (planning and organization). 1.3 Exercise: answer ten questions that demand solutions for everyday problems. 1.4 Group discussion about the exercise. 1.5 Exercise: Each participant will look at a modeland identify, by corresponding numbers, the part that completes the model among five options. Participants will try to complete ten models. 1.6 Group discussion about the exercise. 1.7 Homework: participants will receive five illustrated cards which, when organized correctly, tell a story. The figures must be organized to create a story with logic. The story must be written and presented on the next session.
Executive functions 2nd Session	2.1 Homework: participants will receive ten incomplete figures. They will name the part that is missing in each figure. 2.2 Brief review of the last class. 2.3 Lecture with opportunity for discussion: executive functions and cognitive aging. 2.4 Exercise: participants answer ten questions which show their understanding of social rules and concepts. 2.5 Group discussion about the exercise. 2.6 Exercise: Reading and discussion of a short text. 2.7 Homework presentation and discussion.
Executive functions 3rd Session:	3.1 Homework: answer ten questions about what popular sayings mean. For example, what does this saying mean: "Water dripping day by day wears the hardest rock away". 3.2 Brief review of the last class. 3.3 Lecture with opportunity for discussion: executive functions (mental flexibility) 3.4 Exercise: Each participant will receive a different set of five illustrated cards which, when organized correctly, tell a story. The figures must be organized to create a story with logic. The story must be written and presented to the group. 3.5 Exercise: Participants receive puzzle parts which, when organized correctly, form a Picture of common objects. The must assemble them and create a story for each of them. 3.6 Group discussion about the exercise. 3.7 Homework presentation and discussion. .
Executive Functions 4th Session:	4.1 Homework: participants will receive a magazine news story. 4.2 They must read and summarize the news story. What was the main subject of the story? 4.3 Brief review of the last class. 4.4 Lecture with opportunity for discussion: executive functions (inhibition of improper actions and irrelevant sensory information). 4.5 Exercise: Group reading and discussion of a small text. 4.6 Homework presentation and discussion. 4.7 Review of the cognitive training.
Memory 5th Session:	5.1 5.1 Homework: read pages 17 to 31 of the book *Deu Branco* [26], and answer in a separate sheet: 5.2 List different types of memory. Can you give some examples? 5.2.1 What are the phases of memory? 5.3 Lecture with opportunity for discussion: the stages of memorization (attention, recording e recollection). 5.4 Attention exercise: participants observe Picture individually for 3 minutes, and then they form pairs and tell each other everything they saw in the Picture, which they cannot see anymore. 5.5 Lecture with opportunity for discussion: the sub-systems of memory (immediate memory, operating memory, long-term memory). 5.6 Operating memory exercise: put three words in alphabetical order without writing

Sessions and functions	Strategies for the training of executive functions
	them down.
	5.7 Target task: explaining about the benefits of highlighting for memorizing texts, and a text memorization exercise where participants were encouraged to use highlighters.
Memory 6th Session:	6.1 Homework: read pages 33 to 39 and 51 to 61 of the book *Deu Branco* [26], and answer in a separate sheet: 6.2 What are the main alterations that happen in memory with cognitive aging? 6.3 Give examples of things you can do to improve your memory. 6.4 Brief review of the last class. Lecture with opportunity for discussion: aspects of memory which are altered and aspects which are not altered with cognitive aging. 6.5 Attention exercise: sequences of knocks on the table are turned into digits. For example: ******becomes 3, 1, 2. 6.6 Operating memory exercise: participants observe fragments of words on the board (ta, cof, fee, ble) and mentally form words without using the same fragment twice (table, coffee), without writing them down. 6.7 Target task: explaining about the benefits organization has on memory; explaining how to organize a shopping list into categories (offering an example); memorization exercise: making a list using categories.
Memory 7th Session:	7.1 Homework: read pages 63 to 74 of the book *Deu Branco* [26], and answer in a separate sheet: 7.2 What internal strategies you can use to record the way to your new doctor? 7.3 To record personal information about a new friend? 7.4 To remember the name of a restaurant? 7.5 Brief review of the last class. 7.6 Lecture with opportunity for discussion: presentation of external mnemonic techniques (calendars, lists, alarms, environmental changes) and ways of using them efficiently. 7.7 Divided attention exercise: participants observe a pattern drawn on the board containing several squares, circles, triangles, and hearts; while they repeat a syllabic sequence aloud (pa-pa-ra-pa-pa), they must count how many figures of each type are on the board. 7.8 Operating memory exercise: participants mentally solve simple mathematical operations presented on the board (8 x 2, 3 x 4, 7 x 5) and then add the partial results. 7.9 Target task: explaining about the benefits of highlighting for memorizing texts, and a text memorization exercise where participants were encouraged to use highlighters.
Memory 8th Session:	8.1 Homework: read pages 74 to 84 of the book *Deu Branco* [26], and answer in a separate sheet: 8.1.1 What is the use of the distributed practice technique? 8.1.2 What can we do to remember information which is *on the tip of the tongue*? 8.2 Brief review of the last class. 8.3 Lecture with opportunity for discussion: presentation of internal mnemonic techniques (verbal associations, mental images, stories) and ways of using them efficiently. 8.4 Attention exercise: phonological domain. A participant says a word (affectionate) and the next one must say a word which begins with the last syllable of this word (telephone). Operating memory exercise: put words (for example, adult, baby, adolescent) in the correct time sequence (baby, adolescent, adult). 8.5 Target task: explaining about the benefits organization has on memory; explaining how to organize a shopping list into categories (offering an example); memorization exercise: making a list using categories.

[24;23]. *Adapted*

2.4 Statistical Procedures

Quantitative variables were described using average and standard deviation, or median and interquartile range. Categorical variables were described using absolute and relative frequencies. T-student test was applied for comparing averages between groups. In case of

asymmetry, the Mann-Whitney test was used. Pearson's chi-square test or Fisher's exact test were used for comparing proportions. For intragroup comparisons, the t-student test was used for paired samples (symmetric distribution), and the Wilcoxon test for asymmetric distributions. For comparing the parameter variations between the moments according to group, ANOVA two-way was used. The level of significance used was 5 percent (p≤0.05), and the analyses were done using SPSS, version 21.0.

Before performing the analyzes of the comparison between the two groups, both of them were paired and analyzed to verify if they had a matching profile, ie, the lack of significant differences in age, sex, scholarship, marital status, among others. It was also checked if the performance was similar regarding the entire test that were applied. The data from the analyzes is important because it shows from a sociodemografic and cognitive point of view that everyone started the training, supposedly showing the same level of difficulty.

3. RESULTS AND DISCUSSION

The 83 elderlies who participated in all the phases of the research were divided into two groups: 45 people were in the Experimental Group (EG), and 38 were in the Control Group (CG).

Table 1. Characteristics of the sample

Variables*	Experimental group (n=45)	Control group (n=38)	*P*
Age (years)	69.2±6.1 [60–83]	68.3±6.3 [60-81]	0.500
Sex			0.922
Male	8 (17.8)	8 (21.1)	
Female	37 (82.2)	30 (78.9)	
Marital status			0.390
Married	28 (62.2)	19 (50.0)	
Single	1 (2.2)	4 (10.5)	
Widowed	9 (20.0)	8 (21.1)	
Separated/Divorced	7 (15.6)	7 (18.4)	
Education (years)	12.6±5.0	12.1±5.0	0.621
Lives			0.434
Alone	13 (28.9)	15 (39.5)	
With somebody	32 (71.1)	23 (60.5)	
Occupation			1.000
Yes	3 (6.7)	3 (7.9)	
No	42 (93.3)	35 (92.1)	
Monthy income			0.098
Up to 2 m.w.	4 (8.9)	10 (26.3)	
From 2 to 4 m.w.	14 (31.1)	11 (28.9)	
≥ 5 m.w.	27 (60.0)	17 (44.7)	
Socioeconomic status			0,527
A	9 (20.9)	6 (15.8)	
B	21 (48.8)	16 (42.1)	
C/D	13 (30.2)	16 (42.1)	
Do you have/Have you had any major diseases or health problems?			**0.048**
Yes	32 (71.1)	18 (47.4)	
No	13 (28.9)	20 (52.6)	
Have you ever had a mental disease?			1.000
Yes	9 (20.0)	7 (18.4)	
No	36 (80.0)	31 (81.6)	
Have you ever participated in psychological or psychiatric treatments?			0.054
No	22 (48.9)	27 (71.1)	
Yes, but not anymore.	11 (24.4)	8 (21.1)	
Yes, and still do.	12 (26.7)	3 (7.9)	

*Notes: *described by average±SD, median (percentage 25-75) or n(%)*

Table 2. Evaluation of quality of life using WHOQOL-BREF and WHOQOL-OLD, pre- and post-intervention

Variables*	Experimental group (n=45)	Control group (n=38)	p
WHOQOL-BREF			
Physical			
Pre	69.9±14.5	67.1±19.4	0.452
Post	72.5±17.1	70.2±17.0	0.536
Delta (∆)	2.62±11.4	3.10±11.6	0.849
p (intragroup)	0.131	0.107	
Psychological			
Pre	70.1±13.8	69.8±19.6	0.947
Post	70.5±13.1	71.1±17.2	0.855
Delta (∆)	0.37±11.6	1.23±10.8	0.730
p (intragroup)	0.831	0.488	
Social			
Pre	69.3±16.9	69.5±18.8	0.948
Post	70.7±18.6	67.5±19.2	0.444
Delta (∆)	1.48±19.4	-1.97±15.9	0.383
p (intragroup)	0.611	0.449	
Environment			
Pre	68.3±13.0	67.7±13.4	0.841
Post	70.4±11.9	71.1±11.9	0.785
Delta (∆)	2.15±10.1	3.45±11.8	0.589
p (intragroup)	0.161	0.078	
General			
Pre	73.6±14.7	70.7±21.8	0.490
Post	74.7±15.7	75.0±16.9	0.938
Delta (∆)	1.11±14.1	4.28±12.4**	0.285
p (intragroup)	0.599	**0.041**	
WHOQOL-OLD			
Sensory abilities			
Pre	70.1±20.3	66.8±22.9	0.480
Post	74.0±20.5	73.5±19.6	0.909
Delta (∆)	3.89±22.1	6.74±22.7	0.564
p (intragroup)	0.244	0.075	
Autonomy			
Pre	66.5 ±17.8	67.6±21.0	0.809
Post	69.9±15.4	73.2±16.0	0.337
Delta (∆)	3.33±21.5	5.57±14.7**	0.592
p (intragroup)	0.304	**0.027**	
Past, present, and future activities			
Pre	66.1±13.6	69.1±20.0	0.426
Post	72.8±15.2	68.9±17.8	0.290
Delta (∆)	6.67±13.9""	-0.16±13.1	0.025
p (intragroup)	0.002	0.939	
Social Participation			
Pre	64.4±17.8	62.5±18.8	0.630
Post	67.4±17.7	63.2±17.4	0.280
Delta (∆)	2.92±15.9	0.66±12.5	0.479
p (intragroup)	0.224	0.747	
Death and dying			
Pre	59.4±23.3	63.2±27.9	0.511
Post	61.5±23.0	64.3±29.2	0.636
Delta (∆)	2.08±20.2	1.15±19.4	0.831
p (intragroup)	0.492	0.716	
Intimacy			
Pre	67.8±19.7	68.6±24.5	0.868
Post	70.3±21.5	70.1±23.3	0.966

Variables*	Experimental group (n=45)	Control group (n=38)	*p*
Delta (Δ)	2.50±22.6	1.48±22.8	0.839
p (intragroup)	0.463	0.691	
Total score			
Pre	65.7±11.2	65.8±16.2	0.994
Post	69.3±11.9	68.9±14.2	0.877
Delta (Δ)	3.56±9.33**	2.73±9.39	0.689
p (intragroup)	0.014	0.086	

Notes: *described by average±SD, median (percentage 25-75)); **significant difference between evaluations pre-and post-intervention according to the paired t-student test or Wilcoxon (p<0,05)*

As to the number of patients in the first phase of the research, 145 subjects participated in the pre-test; however, only 57.25 percent of the elderlies participated in all the phases, that is, 83 people. 62 subjects did not participate in the study – that is, 42.76 percent of those who participated in the pre-test.

As to gender, the sample consisted predominantly by female subjects. Both of participants were divided into the experimental group (EG) and control group (CG). The EG was composed of 45 participants, eight male and 37 female, aged 60 to 83 years old. The CG was composed of 38 elderlies, eight male and 30 female, aged 60 to 81 years old. Statistical analyses did not show any significant differences between the ages and sexes of the participants; both groups were considered homogeneous.

Regarding marital status, most of the participants are married. In this aspect, it was also considered statistically homogeneous. There is a predominance of participants with education equivalent to Higher Education Incomplete.

As to the scores related to quality of life, there was significant difference in the comparison between groups in the Past, Present, and Future Activities task of the WHOQOL-OLD, shown in Table 2. The EG increased their scores significantly when compared to the CG. 2.

In the intragroup comparisons the EG showed significant improvement after the intervention in the scores referring to Past, Present, and Future Activities (p=0.002) and total score (p=0.014) of the WHOQOL-OLD. The CG showed significant improvement in the total score of the WHOQOL-BREG (p=0.041).

4. CONCLUSION

This study had as its objective investigating the perception or lack of improvements in quality of life perception comparing the results between two groups composed of elders, participants in the executive function training research.

The CG showed significant improvement in the total score of the WHOQOL-BREF (p=0.041), which may indicate that the fact of participating in a research with pre- and post-testing already had an effect on quality of life perception.

Regarding the WHOQOL-OLD, Domain 1: Sensory Abilities (AS), the effects of visual, hearing, sensory, and appetite alterations on the quality of life were assessed, and no significant differences were found between groups. Thus, according to the interviews, the instruments used for clinical evaluation, and the exclusion criteria, the participants did not present differences in this domain. The scores of the EG and the CG were considered homogeneous pre- and post-testing.

The same results were found in Domain 2: Autonomy (AUT), which is related to issues regarding the independence of the elderly, evaluating to what extent people can make their own decisions and live with autonomy, assessing respect, general control over life, ability to make decisions, and the effects of these factors on the quality of life. Again, no significant differences were found between groups. The EG did not show significant improvement in this domain, but the CG did. The CG may have shown this difference because it showed better health in the pre-test when compared to the EG.

Domain 3: Past, Present, and Future Activities (PPFA) is related to the degree of satisfaction about past, present, and future endeavors, satisfaction about future projects and aspirations, about life achievements, and about feelings and opinions regarding the future. Intragroup comparisons showed that the EG had a significant improvement after the intervention in the scores related to this domain (p=0,002). Thus, it is understood that the participants improved the way they feel about what happened

in their past, what is happening in their present, and what will happen in their future. The CT seems to have been a way for the participants to have a more venturous view of life.

Domain 4: Social Participation (SP) has to do with social participation, participation in daily activities - especially in the community where the participants lives -,opinions about the use of time, and about the ability to participate in activities concerning this population. This domain did not show significant differences in the comparison between groups. This can be explained by the high participation all the elderlies had in various leisure and social activities, described in Table 1.

In the same way, Domain 5: Death and Dying (DD) – concerning worries, expectations, uneasiness, and opinions about accepting death and its inevitability – did not show any significant differences between groups. This is a group of participants that is very socially active, and it is possible that there is no time to worry about these matters.

And, finally, Domain 6: Intimacy (INT) has to do with the ability of cultivating intimate, personal relationships, related to people and social support. In this sense, also no significant differences were found because most seniors are married and have relationship skills.

The results were different from those of a study by [23]. In this study, significant differences were found in the comparison between groups as to the domains of quality of life (WHOQOL-BREF) in the EG: physical health (p<0.001), psychological (p=0.001), and general quality of life (p=0.004). The EG showed a better perception of quality of life after CT. This study found significant differences between groups in the pre- and post-tests in the following domains: personal relationships (p=0.035), psychological (p=0.047), and environment (p=0.022).

The intragroup analysis of the EG showed significant difference in the total score of the WHOQOL-OLD (p=0.014). This means there was an improvement in the perception of quality of life. This means that the training of executive functions helped improve the perceived quality of life in the elderlies.

One important information, considered a confounding variable, is that the EG showed more health problems than the CG. This

difference was statistically significant. This fact may have contributed for the lack of significant differences between groups. So, the CG had better health conditions than the EG before the CT.

Because of the relevance of this subject to the elderly population, it is necessary that public policies be created which encourage treatments involving this age group. There is the need for more studies regarding the elderly, as well as for more investigations regarding what older people consider "quality of life". More evaluation instruments should be created and validated.

The number of studies found relating alterations in EF with quality of life was low. Most studies involve clinical goals, according to a study [27] which emphasized the benefits of relating cognitive performance and perceived quality of life.

The results show that the training of executive functions may influence quality of life perception. Comparisons between the EG and the CG related to quality of life showed significant difference in the Past, Present, and Future Activities task (WHOQOL-OLD) (p=0.025). The EG had a significantly higher improvement in this domain after the intervention when compared to the CG. Intragroup comparisons showed that the EG had significant improvement in the PPFA task and total score of the WHOQOL-OLD, whole the CG had significant improvement in the total score of the WHOQOL-BREF.

It is important to include a neuropsychological evaluation of executive functions in rehabilitation programs for the elderly, besides the use of cognitive screening instruments. It is also important to measure the quality of life for verifying how much the training of executive functions can improve the quality of life in this phase of life. Therefore, it is suggested that studies with a higher number of participants should be done for clarifying the results which showed tendencies, with more control over confounding variables, and also follow-up studies involving more training sessions.

The use of convenience sampling was a limitation of this research. Even though the results point to significant findings which contribute to understanding the elderly and their quality of life, it is important to research other areas and cultures. In this research, all participants were relatively healthy, independent,

and lived in their own homes. So it is not representative of the general population, since people who live in retirement homes were not included, because they are considered more fragile. There were included in this study, subjects who have severe limitations of physical illness, psychiatric in treatment, milder cognitive deficits, which could have an impact on results.

ETHICAL APPROVAL

This section is compulsory for medical journals. Other journals may require this section if found suitable. If human subjects are involved, informed consent, protection of privacy, and other human rights are further criteria against which the manuscript will be judged. It should provide a statement to confirm that the authors have obtained all necessary ethical approval from suitable Institutional or State or National or International Committee. This confirms either that this study is not against the public interest, or that the release of information is allowed by legislation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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