Neurocognitive Stimulation to Improve the Degree of Independence in The Elderly

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KEYWORDS

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ABSTRACT

Background: research in the field of neurocognitive therapy to improve visual-motor coordination in the elderly is scarce, so in this study an intervention protocol was implemented through playful exercises that sought to improve coordination between sight and movement execution of this age group, the exercises were worked seeking to integrate the executive functions to them having as; **Objective:** to improve the visual-motor coordination of elderly residents of the nursing home Sacred Heart of Jesus; **Methods:** This research was descriptive based on the quantitative approach with a transversal cut, an initial evaluation was made during the first week through the Barthel index, after this the program was executed for 10 weeks to finally in the last week reapply the Barthel index and thus obtain the results that were obtained with this age group; **Results:** an improvement was evidenced in the final score compared to the initial where it went from a score of 70. **Conclusions:** in this work a 12-week neurocognitive training program was established, which showed effectiveness in the improvement of visual-motor coordination and quality of life in general in this age group.

1. Introduction

Visual-motor coordination is extremely important in the processes and activities of daily life, it is responsible for coordinating sight and movement, while neurocognitive training in physiotherapy is that which seeks to implement visual, motor, auditory, mental and cognitive stimuli so that through their integration they provide a number of benefits to the elderly and patients in general. (Sociedad et al., n.d., 2020)

Neuroscience is a relatively new specialty in recent times it has had exponential growth, having as its main objective to study the mechanisms and factors that influence the cognitive and physical deterioration of the patient, in a systematic review that included studies from 2007 to 2018 it points out that factors such as music, dance and exercise adequately modulate factors related to aging with cognitive impairment and motor skills (Abrahan et al., 2019)

With advancing age, balance and coordination control decreases, this directly affects the degree of independence of the elderly, deteriorating the somatosensory systems, which is why it is important to have intervention programs that address physical activity by implementing both static and dynamic visual-motor coordination and balance exercises to improve the quality of life of the elderly (Furness et al., 2019).

Visual dependence in the elderly decreases with age and is related to low motor performance, especially in high demand for attention in the face of visual-motor stimuli, adults have low motor and postural control in the face of deceptive stimuli, so it was determined that adults with this condition have a higher risk of suffering falls when presenting low visual-motor control. that is why this work has as its main objective to improve the visual-motor coordination of the elderly residents of the Sacred Heart of Jesus nursing home. (Almajit et al., 2020).

2. Methodology

The research is descriptive based on the quantitative approach with a cross-sectional approach. In order to carry out the physiotherapeutic research work, the inclusion and exclusion criteria were applied, of the residents of the Sacred Heart of Jesus Nursing Home, older adults who present a moderate and high visual deficit as well as older adults who are attending neurocognitive therapy in some other place or rehabilitation center will be excluded. older adults between 65 and 85 years of age were included.

20 people were chosen, socialization and signing of the informed consent began, for this the objectives of the work were explained to the participants, the initial test was carried out for which the Barthel index was used, which has an intraobserver reliability of 0.84 and 0.97 and interobserver reliability of 0.47 and 1.00 according to Kappa indices. This test consists of 10 items which are divided into a score ranging from 0 to 100 where a score of 100 demonstrates total independence and a score of less than 60 already indicates a certain degree of dependence.

The next thing was to apply the intervention of the playful neurocognitive training program, the program consists of exercises of the author's own elaboration where the main purpose was to stimulate the participants cognitively, physically and visually with the aim of improving their degree of independence and thus give greater functionality in the activities of daily life. The program was executed for 12 weeks with two sessions of 40 minutes each week on Mondays and Thursdays, to the proposed exercises additional stimuli are added that seek to work on executive functions such as: attention, memory, perception, reasoning, creative thinking. After the execution of the program in the last week, the Barthel index will be applied again for the final evaluation.

For data validation, the SPSS program in its version 29.0 was used, after its application the results were expressed in tables and applying the comparison of means with the T-Student statistical test, normality was obtained through the Shapiro-Wilk test, this is due to the size of the population, finally with the Wilcoxon test the mean between the initial and final evaluation was obtained. obtaining a significance level lower than $P<0.001$ to accept the alternative hypothesis and reject the null hypothesis.

Among the ethical aspects, this work was approved by the bioethics committee of the Faculty of Health Sciences of the Technical University of Ambato with COD resolution. 034-CEISH-UTA-2023, to guarantee autonomy, confidentiality and good clinical practices. A standardized informed consent was made for the patient to accept and sign

3. Result and Discussion

Results of sociodemographic data

In this study, 20 older adults from the Sagrado Corazón de Jesús nursing home were evaluated, within the population taken we have 13 women who are equivalent to 65% of the sample and 7 men who give the remaining 35%.4 of them are between 65-75 years old which is equivalent to 20% of the sample, 9 people are between 76-85 years of age which is equivalent to 45% of the sample and finally 7 people are between 86 – 95 years of age, which corresponds to 35% of the sample, we found that within the pathological history 2 participants have diabetes, 8 people hypertension, 1 person Parkinson's, 1 person Alzheimer's and 1 person schizophrenia.

Table 1: Sociodemographic data

Sex						
				Frequency	Percentage	Valid percentage	Cumulative percentage
Valid			man	7	35	35	35
			woman	13	65	65	100
			Total	20	100	100	
Categorical age							
				Frequency	Percentage	Valid percentage	Cumulative percentage
Valid			mature older adult	5	25	25	25
			Older Adult	8	40	40	65
			old man	7	35	35	100
			Total	20	100	100	
Personal Background							
				Frequency	Percentage	Valid	Cumulative

					percentage	percentage
Valid		Diabetes	2	10	10	10
		Hypertension	8	40	40	50
		Parkinson	1	5	5	55
		Alzheimer	1	5	5	60
		Schizophrenia	1	5	5	65
		No	7	35	35	100
		Total	20	100	100	

Descriptive statistics of the application of the Barthel index at the beginning and end of the intervention.

Among the results obtained, there is evidence of positive changes in the values presented by older adults in the final evaluation compared to the initial one, initially 5 participants obtained a score of 60 points which is equivalent to 25%, 5 obtained 65 which represents 25%, 2 people 70 of grade which is 100%, 3 a score of 75 that gives 15%, 2 scored 80 which gives 10%, 1 person 85 reaching 5% and 2 people reached a score of 90 being 10%.

At the end of the execution of the project, the participants were evaluated again, finding that 1 person reached 60 points equivalent to 5%, 1 obtained 65 being 5%, 4 people 70 to give 20%, 3 people 75 being 15%, 4 with 80 points to be 20%, 3 with 85 giving 15%, 2 obtained 90 being 10% and 1 person with 95 and 100 points giving 5% for each score.

Table 2: Results of the initial and final application of the Barthel index.

Numeric Initial Barthel					
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	60	5	25	25	25
	65	5	25	25	50
	70	2	10	10	60
	75	3	15	15	75
	80	2	10	10	85
	85	1	5	5	90
	90	2	10	10	100
	Total	20	100	100	
Average	70.75				
Barthel categorical end					
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	total	0	0	0	0
	Grave	0	0	0	0
	Moderate	0	0	0	0
	Slight	20	100	100	100
	Independent	0	0	0	100
Barthel Numerical End					
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	60	1	5	5	5
	65	1	5	5	10
	70	4	20	20	30
	75	3	15	15	45
	80	4	20	20	65
	85	3	15	15	80
	90	2	10	10	90
	95	1	5	5	95
	100	1	5	5	100
	Total	20	100	100	
Average	79				
Barthel categorical end					
		Frequency	Percentage	Valid percentage	Cumulative percentage
Valid	total	0	0	0	0
	Grave	0	0	0	0
	Moderate	0	0	0	
	Slight	19	95	95	95
	Independent	1	5	5	100

	Total	20	100	100	

Descriptive statistics of the initial and final assessment of eating ability in Barthel index applications.

Among the results obtained, positive changes are evidenced in the values presented by older adults in the final evaluation compared to the initial one. In the initial evaluation, 7 participants presented a score of 5 that is equivalent to 35% and 13 participants obtained 10 which is equivalent to 65%, in the final evaluation 100% of the participants showed independence at the time of eating.

Table 3: Results of the assessment of eating capacity at the beginning and end of the intervention.

		Evaluation of the initial Eating Activity		Evaluation of the Eating at the end activity	
Eating activity score		Frequency	Percentage	Frequency	Percentage
Valid	5	7	35	0	0
	10	13	65	20	100
	Total	20	100	100	100.0

Descriptive statistics of the initial and final assessment of washing ability in Barthel index applications.

Among the results obtained, changes were evidenced in the values presented by the older adults in the final evaluation compared to the initial one. In the initial evaluation, 2 participants presented a score of 2 that is equivalent to 10% and 18 participants obtained 5 that is equivalent to 90%, in the final evaluation the percentages were replicated without showing any change.

Table 4: Results of the assessment of the ability to wash at the beginning and end of the intervention.

Initial Wash Activity Assessment		Wash at the End Assessment			
Wash Activity Score		Frequency	Percentage	Frequency	Percentage
Valid	0	2	10	2	10
	5	18	90	18	90
	Total	20	100	20	100.0

Descriptive statistics of the initial and final assessment of dressing ability in Barthel index applications.

Among the results obtained, positive changes are evidenced in the values presented by older adults in the final evaluation compared to the initial one. In the initial evaluation, 19 participants presented a score of 5, which is equivalent to 95%, and 1 participant obtained 10, which is equivalent to 5%, in the final evaluation, 9 participants scored out of 5, which is equivalent to 45%, while 11 participants scored 10, which is equivalent to 55%.

Table 5: Results of the assessment of dressing ability at the beginning and end of the intervention.

		Initial Dressing Activity Assessment		Dressing at the End Assessment	
		Frequency	Percentage	Frequency	Percentage
Valid	5	19	95	9	45
	10	1	5	11	550
	Total	20	100	20	100.0

Descriptive statistics of the initial and final assessment of the ability to arrange in Barthel index applications.

Among the results obtained, positive changes are evidenced in the values presented by older adults in the final evaluation compared to the initial one. In the initial evaluation, 11 participants presented a score of 0, which is equivalent to 55%, and 9 participants obtained 5, which is equivalent to 45%, in the final evaluation, 3 participants have a score of 0, which is equivalent to 15%, and 17 participants with a grade of 5, which gives 85% of the total in the grooming activity.

Table 6: Results of the assessment of the ability to groom at the beginning and end of the

intervention.

		Evaluation of the Fix Initial activity		Evaluation of the Fix at the end activity	
		Frequency	Percentage	Frequency	Percentage
Valid	0	11	55	3	15
	5	9	45	17	85
	Total	20	100	100	100.0

Descriptive statistics of the initial and final assessment of deposition capacity in Barthel index applications.

Among the results obtained, there is evidence of improvement in one participant within the values presented by older adults in the final evaluation compared to the initial one. In the initial evaluation, 2 participants presented a score of 5, which is equivalent to 10%, and 18 participants obtained 10, which is equivalent to 90%, in the final evaluation, 3 participants have a score of 5, which is equivalent to 15%, and 17 participants with a score of 10, which gives 85% of the total in the grooming activity.

Table 7: Results of the assessment of bowel capacity at the beginning and end of the intervention.

		Evaluation of the activity Initial depositions		Evaluation of the activity Stools at the end	
		Frequency	Percentage	Frequency	Percentage
Valid	5	2	10	3	15.0
	10	18	90	17	85.0
	Total	20	100	20	100.0

Descriptive statistics of the initial and final assessment of urination capacity in Barthel index applications.

Among the results obtained, there is no evidence of any change in the values presented by the older adults in the final evaluation compared to the initial one. In the initial evaluation, 7 participants presented a score of 5, which is equivalent to 35%, and 13 participants obtained 10, which is equivalent to 65%, in the final evaluation, 7 participants have a score of 5, which is equivalent to 35%, and 13 participants with a score of 10, which gives 65% of the total in the grooming activity.

Table 8: Results of the assessment of urination capacity at the beginning and end of the intervention

		Evaluation of the initial urination activity		Evaluation of the Urination activity at the end	
		Frequency	Percentage	Frequency	Percentage
Valid	5	7	35	7	35
	10	13	65	13	65
	Total	20	100	20	100.0

Descriptive statistics of the initial and final assessment of toilet usability in Barthel index applications.

Among the results obtained, there is no evidence of any change in the values presented by the older adults in the final evaluation compared to the initial one. In the initial evaluation, 19 participants presented a score of 5 that is equivalent to 95% and 1 participant obtained 10 that is equivalent to 5%, in the final evaluation 19 participants have a grade of 5 that is equivalent to 95% and 1 participant with a grade of 10 that gives 5% of the total in the activity of using the toilet.

Table 9: Results of the assessment of the ability to use the toilet at the beginning and end of the intervention.

		Evaluating the Use Initial Toilet Activity		Evaluating the Using the Toilet Activity at the End	
		Frequency	Percentage	Frequency	Percentage
Valid	5	19	95	19	95
	10	1	5	1	5
	Total	20	100	20	100.0

Descriptive statistics of the initial and final assessment of the ability to move in Barthel index applications.

Among the results obtained, there is evidence of a small change in the values presented by older adults in the final evaluation compared to the initial one. In the initial evaluation, 12 participants presented a score of 10 that is equivalent to 60% and 8 participants obtained 15 that is equivalent to 40%, in the final evaluation 11 participants have a score of 10 that is equivalent to 55% and 9 participant with a grade of 15 that gives 45% of the total in the activity of moving.

Table 10: Results of the assessment of the ability to move at the beginning and end of the intervention.

		Initial Move Activity Assessment		Move End Activity Assessment	
		Frequency	Percentage	Frequency	Percentage
Valid	10	12	60	11	55
	15	8	40	9	45
	Total	20	100	20	100.0

Descriptive statistics of the initial and final assessment of ambulatory ability in Barthel index applications.

Among the results obtained, there is evidence of a small change in the values presented by older adults in the final evaluation compared to the initial one. In the initial evaluation, 16 participants presented a score of 10, which is equivalent to 80%, and 4 participants obtained 15, which is equivalent to 20%, in the final evaluation, 15 participants have a score of 10, which is equivalent to 75%, and 5 participants with a score of 15, which gives 25% of the total in the activity of wandering.

Table 11: Results of the assessment of ambulatory capacity at the beginning and end of the intervention.

		Evaluation of the initial Wandering activity		Evaluation of the End Wandering activity	
		Frequency	Percentage	Frequency	Percentage
Valid	10	16	80	15	75
	15	4	20	5	25
	Total	20	100	20	100.0

Descriptive statistics of the initial and final assessment of the ability to climb and descend steps in the applications of the Barthel index.

Among the results obtained, there is evidence of a positive change in the values presented by older adults in the final evaluation compared to the initial one. In the first evaluation, 3 participants presented a score of 0 which is equivalent to 15% and 17 participants obtained 5 which is equivalent to 85%, in the final evaluation 1 participant has a grade of 0 which is equivalent to 5%, 17 participant with a grade of 5 which gives 85% and 2 participants with a grade of 10 to give 10% of the total in the step activity.

Table 12: Results of the assessment of the ability to go up and down steps at the beginning and end of the intervention.

		Evaluation of the initial Steps activity		Evaluation of the Steps activity at the end	
		Frequency	Percentage	Frequency	Percentage
Valid	0	3	15	1	5.0
	5	17	85	17	85
	10	0	0	2	10
	Total	20	100	20	100.0

DISCUSSION

In this research work it was observed that through neurocognitive training it was successfully possible to improve the degree of independence in the elderly of the Sacred Heart of Jesus nursing home, this finding is of great importance since the elderly as they age their sensory and motor capacities are diminishing which affects their independence to perform their activities. An adequate training program will provide this age group with new skills, as well as enhance those that have been decreasing with age in order to improve their functionality and quality of life in general.

The results of this work show a clear improvement in the capacities of the activities of daily living of

the elderly with a predominance of visual-motor life, which coincides with the research work of Chasag T. (2023) that through the implementation of the treatment with the Perfetti method, which is a type of neurocognitive treatment, the functionality and quality of life of the study group was improved, improving not only these aspects, but also they also presented benefits in cognitive and social abilities, increased mood and execution of activities of daily living. (Chasag et al. 2023)

Reviewing the work of Cuvillo M. et al. (2022), where a systematic analysis of the current scientific evidence on multisensory cognitive rehabilitation was carried out, they are significantly superior to those obtained with other types of treatments, with most of these works being evaluated with functional tools, where significant improvements were presented in both balance and gait, which will be reflected in an optimization in the execution of life activities of the elderly. (Cuvillo et al. 2022)

4. Conclusion and future scope

Within this research, it is determined that neurocognitive therapy in the elderly improved the degree of independence of the members of the group, who were residents of the Sacred Heart of Jesus nursing home. This improvement was achieved through the application of a program of neurocognitive exercises of a playful type, in which the executive functions of the older adults were worked on, the work increased in complexity as each week of treatment went by, it was carried out for a period of 12 weeks with the members being evaluated at the beginning and at the end of said program, The group was made up of 20 older adults who were made up of 5 people between 65 and 74 years old, 8 people between 75 and 84 years old and finally 7 members who were 85 years old or older, this group was made up of 7 men and 13 women.

An improvement of 10 points from the initial to the final evaluation was observed in the observed group, going from an initial average score of 70.75 to a final one of 79, which was reflected in an improvement in the quality of life of the group. Through this work, synaptic neuroplasticity and extraneural plasticity were enhanced through the stimulation of the exercises implemented in the work executed, since they implemented different degrees of complexity, as well as simple and double task executions, which was beneficial in the state of the participants, increasing their levels of reaction. attention and motor skills in general.

By comparing the final evaluation with the one initially carried out, it was possible to establish the state of the degree of independence of the older adults in the face of the activities of daily living, which gave a positive result, since the average of the final evaluation rose by 10 points, which was reflected in several activities, the older adults went from having some degree of dependency to decreasing it or becoming independent, which will improve their quality of life and even their self-confidence.

As the main result of this research, it was possible to establish a neurocognitive training program so that it can be implemented in the Sacred Heart of Jesus Nursing Home, which can be used and applied by the professionals of the establishment and be able to help in the maintenance, treatment and care of the resident older adults, this program consists of 10 weeks of exercises working 2 days a week for 40 minutes each day.

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