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El impacto del aprendizaje del idioma inglés en el proceso cognitivo de los adultos mayores

The impact of English language learning on the cognitive process of older adults

O impacto da aprendizagem da língua inglesa no processo cognitivo dos idosos

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Resumen

Se realizó un estudio cuasiexperimental antes y después de un curso de aprendizaje de inglés de seis meses para adultos mayores para evaluar el efecto cognitivo del aprendizaje de otro idioma en este grupo de edad en la comunidad de Nitiluisa, de la ciudad de Riobamba. La población y muestra de este estudio fueron 30 adultos mayores donde 16 son hombres y 19 son mujeres, a quienes se les realizó una evaluación neurológica y neuropsicológica al inicio y seis meses después del curso incluyendo pruebas de función ejecutiva como memoria de trabajo y procesos de atención. Por lo tanto, los resultados muestran una asociación estadística significativa entre la alteración de la percepción olfativa relacionada con la edad. Asimismo, las pruebas neuropsicológicas arrojan datos interesantes que relacionan el mantenimiento e incluso la mejora cognitiva en el Performance Testing Direct and inverse series (WAIS III) y Symbol Digital Modality Test (SMDT) seis meses después de iniciar un curso de aprendizaje de inglés. En conclusión, el estudio sostiene que aprender inglés, incluso sin el objetivo funcional de un nuevo idioma, puede tener un efecto protector sobre las funciones ejecutivas y las redes neuronales del cerebro, según afirman los primeros hallazgos en pacientes con deterioro cognitivo. Por lo tanto, los estudios sugieren realizar este seguimiento a largo plazo en el tiempo para encontrar evidencia más sólida, relacionada con la bibliografía internacional.

Palabras clave: Deterioro cognitivo; Demencia; Aprendizaje del idioma inglés; Neuro protección.

Abstract

A quasi-experimental study was conducted before and after a six-month English learning course for older adults to evaluate the cognitive effect of learning another language in this age group in the community of Nitiluisa, Riobamba City. The population and sample of this study were 30 older adults, 16 men and 19 women, who underwent a neurological and neuropsychological evaluation at the beginning and six months after the course, including executive function tests such as working memory and attention processes. Therefore, the results show a significant statistical association between age-related alteration of olfactory perception. Likewise, neuropsychological tests provide interesting data that relate maintenance and even cognitive improvement in the Direct and Inverse Series Performance Testing (WAIS III) and Symbol Digital Modality Test (SMDT) six months after starting an English learning course. In conclusion, the study argues that learning English, even

without the functional goal of a new language, can have a protective effect on executive functions and neural networks of the brain, as stated by the first findings in patients with cognitive impairment. Therefore, the studies suggest carrying out this follow-up over time to find more solid evidence, related to the international literature.
Keywords: Cognitive impairment; Dementia; English language learning; Neuroprotection.

Resumo

Foi realizado um estudo quase experimental antes e depois de um curso de aprendizagem de inglês de seis meses para idosos para avaliar o efeito cognitivo da aprendizagem de outra língua nesta faixa etária na comunidade de Nitiluisa, na cidade de Riobamba. A população e amostra deste estudo foram 30 idosos, 16 homens e 19 mulheres, que foram submetidos a uma avaliação neurológica e neuropsicológica no início e seis meses após o curso, incluindo testes de função executiva como memória de trabalho e processos cognitivos. Portanto, os resultados mostram uma associação estatística significativa entre a alteração da perceção olfativa relacionada com a idade. Da mesma forma, os testes neuropsicológicos fornecem dados interessantes que relacionam a manutenção e até a melhoria cognitiva nos testes de desempenho série direta e inversa (WAIS III) e no teste de modalidade digital de símbolos (SMDT) seis meses após o início de um curso de aprendizagem de inglês. Concluindo, o estudo sustenta que aprender inglês, mesmo sem o objetivo funcional de uma nova língua, pode ter um efeito protetor nas funções executivas e nas redes neuronais do cérebro, de acordo com as primeiras descobertas em doentes com défice cognitivo. Assim sendo, os estudos sugerem a realização deste seguimento a longo prazo ao longo do tempo para encontrar evidências mais sólidas, relacionadas com a bibliografia internacional.
Palavras-chave: Comprometimento cognitivo; Demência; Aprendizagem da língua inglesa; Neuroproteção.

Introducción

According to data from the VIII Population Census and VII Housing Census carried out by the INEC in Ecuador in 2022, it indicates that the Ecuadorian population is around 17 million inhabitants (16,938,986), of which more than one and a half million (1,520,590) correspond to adults aged 65 years or older. The province of Chimborazo has a population of 53,730 older adults (INEC, 2022), of which 6,481 older adults are affiliated with the Peasant Social Security for old-

age retirement benefits (IESS, 2022). INEC projects that Ecuador will have more older adults by 2050, therefore, there will be fewer children and adolescents. This implies that neurological conditions such as dementia will increase in the older adult population.

The Neuropathology Group of the Medical Research Council Cognitive Function and Ageing Study defines 'dementia' as degenerative diseases that affect higher mental functions, which later become neurological pathologies, which have a significant impact on the quality of life of the affected people and on society in general. At the same time, it points out that Alzheimer's and vascular dementia are the most frequent diseases both internationally and in Ecuador(MRCCFAS, 2001). Studies maintain that Alzheimer's and vascular dementia can coexist with other chronic pathologies such as diabetes, high blood pressure, etc., due to being in the age group of older adults, where age is the determining risk factor (Haan & R., 2004). On the other hand, a study carried out in the city of Quito by FARYPDEA concludes that the risk factor for 'dementia' is related to the low level of education of the affected people (Espinosa, Espinosa, & Garzon, 2012). Consequently, in order to minimize these conditions, programs must be created to improve the lifestyles of older adults, for example: physical exercise programs, diet, mental training, etc.

According to (Middleton & Ya, 2009), 'dementia' in older adults begins as a process in middle age and that long-term work modifying the associated risk factors could clearly have a positive impact on the outcome of these diseases, taking into account age as a risk factor. And from the risk factor of low educational level or illiteracy, 'dementia' was reflected in the depressing living conditions of older adults. Therefore, education in adulthood has positive effects in the prevention of 'dementia'. This is how several studies conclude that learning a second language has neuroprotective effects on dementia, supporting this assertion with the comparison of neuropsychological performance in older adults who master one or two languages, records of databases of memory clinics comparing the age of onset of dementia between these two groups and the use of neuroimaging studies to support the neuroanatomical basis of the generation of new networks and synapses (Launer, y otros, 1999). This implies the need to generate prevention programs with strategies and activities in the field of health and education from childhood to adulthood in order to delay the onset of 'dementia' by a few years. Similarly, several studies maintain that the delay in the onset of 'dementia' is due to an effective application of preventive programs taking into account factors such as education, exercise, the development of physical activities and cognitive reserve (Bialystok, Craik, & Freedman, 2007).

The present study raises the hypothesis: “If the English language learning, the cognitive process will improve in the adults older”. Therefore, to operationalize the present study that allows us to respond to the proposed proposal the following objective is presented “to determine the impact of the English language learning on the cognitive processes of the adults older from Nitiluisa community at IESS Center, Calpi Parish, Riobamba canton, Chimborazo Province.

Theoretical Framework

The theoretical framework is performed according to the study’s variables and supporting by the ‘documentary research’ focus on describe the ‘working memory’, ‘operative memory’, ‘sustained attention’ and ‘speed of information processing’. Therefore, the variables research in this study are as Independent Variable, ‘cognitive process’, and the dependent variable, ‘English language learning’

Cognitive process in older adults

Cognition is the ability of human beings that allows to receive information from our environment, where the brain is able to assimilate and interpret what it receives through sensory capabilities. The main cognitive processes are perception, attention, learning, memory, language, emotions, reasoning and problem solving (Salazar & Mayor, 2020).

Cognitive functioning is defined as the intellectual part of every human being, which allows them to interact with the environment. In the aging stage, manifestations that indicate anatomical physiological changes at the brain level begin, biochemical and metabolic changes occur, which together with brain plasticity and the activity of various brain functions, increase the possibility of generating cognitive alterations or in turn allow them to continue with their normal cognitive functioning (Manchola, y otros, 2020).

Working Memory

Working memory is defined as the mental process by which we are able to store information temporarily, so that we can later use it when it is not accessible to our senses. The information can be from an external stimulus, for example, something that has just been explained to us, or from stored stimuli, that is, a concept that we have already studied previously. It is a type of short-term memory that includes the prefrontal cortex, and this is the one in charge of controlling executive

functions. That is why working memory allows us to reason, plan and make decisions. It is one of the executive functions that we use most in our daily lives, as it helps us to understand two or more pieces of information that have occurred to us in a very close space of time. It also allows to associate new knowledge with what we already have stored. In addition, it gives us the ability to retain information while we are focused on another circumstance (López, 2011).

Sustained Attention

'Sustained attention' is the ability that humans have to maintain focus on a specific activity or stimulus for a given period of time. In other words, it is the type of attention that allows us to focus on an activity for the period of time necessary to achieve it, without being prevented by distractions. This cognitive ability is undoubtedly very important in our daily lives as it allows us to be efficient and to be able to meet our objectives. Moreover, 'sustained attention' is divided into concentration and vigilance, in order to detect the stimulus or activity that wanting to carry out and to be able to focus our concentration in order to subsequently be able to carry it out. In conclusion, 'sustained attention' is the ability to keep the attention on a given task for a prolonged period of time without making mistakes. Also, this cognitive ability is essential for many tasks and activities of daily life (Flores, Bernal, & De la Serna, 2018).

Speed of Information Processing

Information processing speed (IPS) is a measure of the efficiency of cognitive function. It is assessed using timed tests that typically challenge relatively simple cognitive operations. IPS is expressed in terms of reaction time, the time required to complete a series of operations, or the number of items answered correctly in a set period of time. Clinical instruments designed to assess IPS range widely from simple reaction times to more complex measures, such as the Processing Speed Index of the Wechsler intelligence scales (Lawrence, 2011).

English Language Learning

Human beings, in their natural development, acquire the ability and skill to master at least one language. However, in the acquisition of a second language, when one is an adult, (Krashen, 1983) establishes with hypothetical criteria, this acquisition occurs in two ways, 'unequal' and

'autonomous' to develop the competence of a second language. This way expresses the achievement of language in an explicit and implicit way. In the first, learning a second language is a process like those which children develop when learning their mother tongue. On the other hand, learning is informal and natural. Krashen addresses the theory of the second language where children acquire it while adults learn it. In the successive phases of teaching-learning, it is highlighted that, for the teaching of the English language, the starting point is the student, who is considered the object of education. In this sense, educators address different teaching methods, contextualizing the approaches that guide the nature and learning of the language. These approaches are the point of view from which a systematic process of linguistic knowledge for teaching the English language is derived. Thus, the approaches can be grouped into five: traditional, natural, structural, communicative and humanistic (Palacios & Florencia, 2020).

English Language Learning Programs

ELL programs exist in various forms but there are three key factors that these programs must address to be successful: ensuring continuity, developing a strong monitoring and evaluation. To begin with, ensuring continuity is essential to amplify a program's reach and increase English proficiency. After that, a strong framework is also important to ensure a program's effectiveness. Finally, evaluation systems are weak and little effort is given to measuring the effectiveness of current approaches (Cronquist & Fiszbein, 2017).

According to the Common European Framework of Reference, at Level A1-Elementary, learners can understand and use very common everyday expressions and simple phrases for immediate needs. Next, introduce themselves and other people and can ask and answer questions about personal details, such as where they live, things they have and people they know. Finally, communicate in a simple way if the other person talks slowly and clearly.

Basic English Language Skills

Halliday (1978) defines basic English language skills as the inherent receptive and productive linguistic capabilities of the human being. Reading and listening are predominantly receptive skills while speaking and writing are productive skills that not only require the ability to recognize different elements of language but also combine them in a creative way to produce new speech or text writing. These communication skills are usually used in an integrated way, that is, we typically

speak and listen or read and write at the same time. Therefore, the basic skills are listening, speaking, reading, and writing.

Listening

The 'listening' skill, according to Halliday (1978), is an interactive process that consists of perceiving and constructing messages through a number of cognitive and affective mechanisms. It is essential to understand what others say in order to respond or respond to another person.

The topics for practicing listening to 6 months to the older adults at A1 are 'a request from your boss', 'a voicemail message', 'booking table', 'business cards', 'finding the library', 'meeting a new team member', 'meeting other students', 'meeting people at a dinner', 'ordering a café', 'shopping for clothes'

Speaking

From a Communicative approach, 'auditory' and 'oral' skills are closely related. The acquisition of oral skills is a gradual and directed process, in which the student practices the language in a real way through discussions, conversations, or other strategies that motivate him to express himself orally. Therefore, the 'communicative' approach prioritizes the development of oral skills in the teaching-learning process of a foreign language in order to communicate efficiently with the native and non-native of the English language (Halliday.1978).

The topics for practicing speaking to 6 months to the older adults at A1 are 'checking understanding', 'making suggestions', 'meeting new people', 'talking about other people', 'talking about where you are from'

Reading

According to Goodman's Kenneth (1970, cited in Brown, 2001), 'reading' is a process that includes factors such as intellectual skills such as inferring or interpreting meaning, retention of information, experience in understanding a text, etc., and knowledge of a variety of linguistic signs such as morphemes, syllables, words, phrases, etc. Comprehensive reading involves the intelligence to interpret the text, whether it is being read in the native language or a foreign language. People normally read for two main reasons: for pleasure as in the case of novels, short stories, poems, etc.;

or to obtain information, that is, to find out something or to do something with that information. Consequently, reading is an interactive process that is best developed when associated with writing, listening comprehension, or speaking activities.

The topics for practicing reading to 6 months to the older adults at A1 are ‘a poster at work’, ‘a poster for exam candidate’, ‘a restaurant menu’, ‘a study timetable’, ‘an airport departures board’, business card’, ‘dictionary definitions’, ‘holiday home adverts’, ‘job adverts’, ‘notes at work’.

Writing

Brown (2001) considers 'writing' as a type of reinforcement and extension of other skills such as listening, speaking, and reading. It is very important in the process of learning the English language since it initially helps to develop oral expression and listening. There is a variety of written texts, each one represents a different genre and has certain rules for its production, for example: reports, essays, articles, letters, diaries, messages, advertisements, addresses, recipes, invitations, maps, etc.

The topics for practicing writing to 6 months to the older adults at A1 are ‘a message to say you are late’, ‘a notice board message’, ‘a text message invitation’, ‘a thank you email’, ‘an application form’, ‘an email to book a hotel’, ‘an email to confirm an appointment’, ‘an email to congratulate a colleague’, ‘instructions for a colleague’, ‘online course introductions.

Grammar and vocabulary are planned as a cross-cutting axis in the A1 level English program. Then, the ‘grammar content’ is ‘adjectives and prepositions’, ‘adjectives ending in -ed and -ing, ‘articles a-an-the’, ‘articles the or no article’, ‘comparative adjectives’, ‘infinitive of purposes’, ‘countable and uncountable nouns’, ‘present simple and present continuous’, ‘preposition of place on-in-at’, ‘preposition of time at-in-on’, ‘question forms’, ‘using there is and there are’.

By the time, vocabulary content is ‘accessories’, ‘actions’, ‘appearance’, ‘bedroom’, ‘body parts’, ‘clothes’, ‘colors’, ‘daily activities’, ‘drinks’, ‘everyday objects’, ‘farm animals’, ‘food’, ‘fruits’, ‘holydays’, ‘homes’, ‘hotels’, ‘jobs’, ‘kitchens’, ‘living rooms’, ‘meals and cooking’, ‘money’, ‘moving’, ‘nature’, ‘places in a town’, ‘restaurants’, ‘school’, ‘shopping’, ‘transport’, ‘weather’.

Materials and methods

The research methodology applied in this study had a ‘mixed’ approach in that this approach represents a set of systematic, empirical, and critical research processes and involves the collection and analysis of quantitative and qualitative data. Likewise, the design of this research was of a

'quasi-experimental' type where at least one independent variable is deliberately manipulated to observe its effect and relationship with one or more variables. But rather these groups are already formed before the experiments, also known as intact groups (Hernández-Sampieri, 2018).

In addition, this study was conducted on a group of older adults from Nitiluisa community, who took a six-month standardized English learning course at Level A1 according to the Common European Framework of Reference (CEFR) offered by the linkage group of the project named 'Promotion of healthy lifestyles in older adults from Seguro Campesino of the Chimborazo province', from ESPOCH.

At last, the scope of the research was Descriptive since it seeks to specify the properties, characteristics, and profiles of people, groups, communities, processes, objects, or any other phenomenon that is subjected to an analysis (Urréa, 2021). Also, the types of research that this study performing were 'field research' and 'documentary research'. 'Field research' bases its work on obtaining information about the object of study in the place where the phenomenon to be studied occurs, which means that the researcher moves to the place where the phenomenon occurs. Likewise, documentary research is based on obtaining and analyzing information about an object of study from different bibliographic or documentary sources where the analysis and interpretation of the researcher predominate (Quishpe, 2022). On the other hand, the method to analyze generalities about English learning and cognitive process for adults older were the 'deductive-inductive' method. This implies that the 'deductive' method studies the phenomenon from its generality to particular situations, while the 'inductive' method establishes the generality specific cases. Consequently, these methods work in duality (Germán, 2021).

The 'sample' in the present study corresponds to the 'population' because the population is defined as small and finite. Therefore, the population of the Experimental Group and Control Group were 60 older adults from Nitiluisa community at IESS Center, Calpi Parish, Riobamba canton, Chimborazo Province. Therefore, the study sample was made up of two groups. One, 'Experimental Group-EG' or group that receives the stimulus. Two, 'Control Group-CG' or group that does not receive the stimulus. Additionally, the 'sample' was stratified by gender (EG: men=16, women=14, total 30 students) and (CG: men=10, women 20, total 30 students) (Pantoja, 2022).

The techniques to organize and analyze the data in the present study were the field and the office technique. The 'field technique' consists of directly obtaining information from the primary

sources under study. The ‘office technique’ consists of the procedure to process and analyze the data through the classification of information through coding and tabulation, to then carry out the analysis, and in this way prepare and interpret the data, to finally write the report that contains the results of the research (González, 2019).

The techniques used for data collection was the Survey. The ‘survey’ allows us to directly obtain information from the students who are related to the object of the research, and thus the ‘questionnaire’ instrument was used, composed by 3 three neuropsychological tests such as Letter Number Sequencing (LNS-WAIS-III), which allows the assessment of working memory and attentional processes, placing emphasis on the central executive; Symbol Digital Modality Test (SDMT), which allows to assess sustained attention and information processing speed; and Forward and reverse series (WAIS III), which allows to evaluate working memory and sustained attention.

The analysis of the results was carried out through the ‘triangulation’ method as it allows the examination of a topic or phenomenon from various sources or data to improve the validity, reliability, and exhaustiveness of the research results (Abbadia, 2023). In addition, descriptive statistics were applied such as frequencies and percentages, as well as inferential statistics applying the ‘Chi2 (categorical variables 2x2)’ and Kendall's Tau-b (ordinal variables) and eta (nominal variables by interval) to determine the association. Finally, the McNemar test was used determine changes after the learning process. Thus, the results were interpreted with the contribution of the theoretical framework related to each of the variables of the hypothesis with theory and practice.

Results

The participants in this study were assessment at the beginning of the course, at the end of it, and six months after having finished it. So, the experimental group was taken three neuropsychological tests to assess alterations in working memory, operative memory, sustained attention and speed of information processing. Thus, these tests seem to be very sensitive and could show the effects of English learning as a new language. In addition, all participants underwent a general neurological examination. Also, the three tests’ scores below the mean were categorized as low, scores between the mean and the standard deviation as medium, and scores above the mean as high.

The study group included 30 older adults (16 men and 14 women) between the ages of 65 and 85 years. The neurological examination showed the following abnormal findings. At first, 4 cases

(13.33 %) with 'hyposmia', which was more frequent in female. Afterwards, 1 case with 'dysmetria' (3.34 %) and 4 cases with 'postural fine tremor of upper limbs' (13.33 %), which was more frequent in men. Meanwhile, 'rigidity' was found in 4 cases (13.33 %), being more frequent in women. Therefore, there is a statistically significant association between the finger-nose motor examination and gender ($p < 0.05$). (Table 1)

Table 1: *Neurological examination*

Neurological Examination		**Male**		**Female**		**Total**	
		(n=16)	**%**	**(n=14)**	**%**	**(n=30)**	**%**
Eye Movements	Normal	16	100	14	100	30	100
Sensible	Normal	16	100	14	100	30	100
Olfactory	Normal	15	93.75	11	78.57	26	86.67
	Hyposmia	1	6.25	3	21.43	4	13.33
Ex. Finger-nose motor	Normal	12	75	13	92.86	25	83.33
	Dysmetria	1	6.25	0	0.00	1	3.34
	Postural tremor of hands	3	18.75	1	7.14	4	13.33
E.M. Tone	Normal	15	93.75	11	78.57	26	86.67
	Rigidity	1	6.25	3	21.43	4	13.33

Author: *Researchers*

Note: *Results of the neurological examination by gender of the older adults from Nitiluisa community, Riobamba 2024*

The results according to Letter Number Sequencing (LNS-WAIS-III) Test during the assessment of the 'working memory' and 'attentional processes' with emphasis on the central executive through a sequence of numbers and letters determined that after the six months of English language learning of intervention, there was a decrease in the percentage of 'low' scores from 61.11 % to 50 %. Once, the 'medium' scores were increased from 36.36 % to 43.33 %. At the same time, the 'high' scores were increased from 5.56 % to 6.67 %. Consequently, no statistically significant association was found. (Table 2).

Table 2: *Letter Number Sequencing Test (LNS-WAIS-III)*

Post-intervention Number and Letter Sequence		**Pre-intervention Number and Letter Sequence**						**Total**	**%**
		Low	**%**	**Medium**	**%**	**High**	**%**		
6 months	**Low**	11	61.11	4	36.36	0	0	15	50
	Medium	6	33.33	7	63.64	0	0	13	43.33
	High	1	5.56	0	0	1	100	2	6.67
TOTAL		18	100	11	100	1	100	30	100

Author: *Researchers*

Note: *Results of the Letter Number Sequencing Test (LNS-WAIS-III) of older adults from Nitiluisa community, Riobamba 2024, after six months of English language learning of intervention.*

The results according to Reverse and Direct Tests (WAIS-III) during the assessment of the 'working memory' and 'sustained attention' after the six months of English language learning of intervention, there was a decrease in the percentage of 'low' from 16.67 % to 6.67 %. After that, the 'medium' level was kept at 80 %. Finally, the 'high' level was increased from 3.33 % to 13.33 %. Therefore, no statistically significant association was found ($p > 0.05$ %) (Table 3).

Table 3: *Reverse and Direct Test (WAIS-III)*

Reverse and direct tests post intervention		**Reverse and direct tests pre intervention**						**Total**	**%**
		Low	**%**	**Medium**	**%**	**High**	**%**		
6 months	**Low**	1	16.67	1	5	0	0	2	6.67
	Medium	5	83.33	16	80	3	96.67	24	80.00
	High	0	0.00	3	25	1	3.33	4	13.33
TOTAL		6	100	20	100	4	100	30	100

Author: *Researchers*

Note: *Results of the Reverse and Direct Test (WAIS-III) of older adults from Nitiluisa community, Riobamba 2024, after six months of English language learning of intervention*

The results according to Symbol Digital Modality Tests (SDMT) during the assessment of the 'sustained attention' and 'information processing speed' after the six months of English language learning of intervention, there was a decrease in the percentage of 'low' from 33. % to 3.33 %.

Also, 'medium' level was increased from 79.17 % to 80 %. Finally, the 'high' level was decreased from 20.83 % to 16.67 %. In conclusion, no statistically significant association was found (p > 0.05%) (Table 3).

Table 3: *Symbol Digital Modality Test (SDMT)*

Post-intervention sequence		**Pre-intervention sequence**						**Total**	**%**
		Low	**%**	**Medium**	**%**	**High**	**%**		
6 months	**Low**	1	33.33	0	0	0	0	1	3.33
	Medium	2	66.67	19	79.17	3	100	24	80.00
	High	0	0	5	20.83	0	0	5	16.67
TOTAL		3	100	24	100	3	100	30	100

Author: *Researchers*

Note: *Results of the Symbol Digital Modality Test (SDMT) of older adults from Nitiluisa community, Riobamba 2024, after six months of English language learning of intervention*

Discussion

The findings in this study show the relevance of several data collected such as the 'Neurological Examination', the 'Letter Number Sequencing Test' (LNS-WAIS-III), 'Direct and Inverse Series Test' (WAIS-III), and 'Symbol Digital Modality Test' (SDMT).

To begin with, the 'neurological examination' shows a change in the functions related to smell and changes in muscle tone. Thus, the results show a special association with age when the epidemiological background is known. On the other hand, the 'hyposmia' is frequent in the older adult, for that reason, a long-term follow-up of these patients is interesting because some of these findings can be predictive factors over time related to neurodegenerative diseases such as Parkinson's disease in agreement with the pointed out by (Takeda, Baba, & Kikuchi, 2014) in the Olfactory Dysfunction and Dementia in Parkinson's Disease study, as well as the Predicting Parkinson disease in the community using a nonmotor risk score development study by (Darweesh, Koudstaal, Stricker, Steyerberg, & Ikram, 2016).

Meanwhile, the results of the Letter Number Sequencing Test (LNS-WAIS-II) that is related with the 'working memory' assessment suggest a cognitive maintenance at 6 months, clearly the older

adults classified as in the middle and high stratum. Therefore, the data does not show a strong statistical association in according to the Wechsler Adult Intelligence Scale-III (Wechsler, 1999)

After that, regarding the comparable results of the Direct and Inverse Series Test (WAIS-III), the results show an increase in the number of older adults at a 'high' level (almost doubled) as well as a significant reduction in the number of older adults at the 'low' level (6.67 % reduction). Thus, the older adults at the 'medium' level maintained their number. All in all, these findings as in the previous test, despite not showing a statistically significant association clearly show us a tendency towards cognitive maintenance and reduction of low levels of performance in the functions of 'sustained attention'.

Finally, the results of the Symbol Digital Modality Test (SDMT) show a similar percentage of participants (79.17 % pre-test vs 80 % post-test) remain in the mean. To sum up, this finding allows to perceive that these patients maintain the 'speed of information processing' and 'sustained attention' in agreement with the postulate raised by (Smith, 1982).

Conclusions

These results allow to conclude that the older adults who participated in this study seem to show maintenance of 'executive functions' related with the strengthening of 'cognitive reserve', by strengthening and protecting the executive control circuits more than those related to memory as suggested by (Gold, 2015). Therefore, it is of vital importance to provide spaces in which the older adults can remain mentally active and thus reinforce their 'cognitive reserve' in order to prevent possible neurodegenerative diseases.

The age group of older adults' demand to the Ecuadorian society the necessity of keeping and generating programs of English language learning that allow to see the reality of the health of this age group. Thus, these programs can make a contribution to the benefit of health and well-being of the older adults from Nitiluisa community, from Riobamba as well as older adults from all Ecuador.

In the end, at the neurobiological level, there is a fundamental factor when justifying the importance of implementing programs to prevent cognitive decline as an English language Learning course, which is called brain plasticity. It means that every older adult brain can adapt to external and internal demands as explained (Gispen, 1993). Although, this plasticity decreases with the age, its existence is evident throughout the life process. Moreover, it is clearly described that older adults

possess plastic capacities that allow the central nervous system to acquire learning as supported by (Chapell, 1996).

Finally, the results obtained in this study allow to respond to the hypothesis that the English learning has a significative impact positive on 'cognitive processes' in older adults.

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