

Episodic Memory and Elderly People: Main Alterations from Different Cognitive Interventions

Fernanda de Sousa Rocha^{1,*}  & Isabelle Patrícia Freitas Soares Chariglione² 

¹Universidade Católica de Brasília, Brasília, DF, Brasil

²Universidade de Brasília, Brasília, DF, Brasil

ABSTRACT – Aging entails many cognitive changes, including episodic memory, which may be potentiated depending on the lifestyle of the elderly person and stimulated through cognitive interventions. The objective of this study was to verify whether there are differences in episodic memory and mood in different interventions. A total of 46 elderly people, of both sexes, with an average age of 68.7 years ($SD = \pm 6.82$) participated in the study, being divided in two groups, stimulation (*Stimulus* = 21) and training (MEMO = 25), and tests of diagnostic and memory measures were applied before and after intervention. A difference in episodic memory was observed between the interventions, as well as an improvement in their mood, regardless of the type of intervention.

KEYWORDS: Episodic memory, Cognitive intervention, Elderly

Memória Episódica e Idoso: Principais Alterações a partir de Diferentes Intervenções Cognitivas

RESUMO – O envelhecimento acarreta uma série de alterações cognitivas, incluindo a memória episódica, que pode ser potencializada a depender do estilo de vida do idoso e estimulada através de intervenções cognitivas. O objetivo desse estudo foi verificar se há diferenças relacionadas à memória episódica e ao humor em diferentes intervenções. Participaram do estudo 46 idosos, de ambos sexos, com idade média igual a 68,7 anos ($Dp = \pm 6,82$). Foram divididos em dois grupos, sendo um estimulação (*Stimulus* = 21) e outro treino (MEMO = 25), e aplicados testes de medidas diagnósticas e de memória nos momentos pré e pós-intervenção. Foi observado que há diferença de memória episódica entre as intervenções e melhora no estado de humor, independentemente do tipo de intervenção.

PALAVRAS-CHAVE: memória episódica, intervenção cognitiva, idoso, saúde do idoso, envelhecimento

The aging process is currently seen as a highly relevant social reality, given the increase in scientific production on the cognition of the elderly in recent decades and also the increase in the age of the population (Carvalho et al., 2009; Chariglione & Janczura, 2013; Belleville et al., 2017; Hallgren et al., 2018; Morando et al., 2018). This process can be understood as a continuum of changes in the human development during the aging process, including predictable cognitive changes in the individual's age group. Such transformations can be influenced by lifestyle choices, so that factors such as diet, physical activities, changes in mood, use of medications, cognitive stimulation, among others, can be determinant to the possible aging scenarios

(Carvalho et al., 2009; Zokaei et al., 2017; Raymundo et al., 2017).

The main cognitive alterations pointed out through studies are the significant decrease in the speed of information processing, considered as the basis that allows the reduction and dissociation in the performance of the other cognitive processes, and the difficulty of performing activities that require reasoning, memory, language and executive functions (Souza et al., 2009; Sposito et al., 2016; Raymundo et al., 2017). These changes can be directly influenced by the current mood states of the elderly, because, depending on the swing between euphoria and depression, cognitive processes tend to vary. Learning and memory

* E-mail: mrsfernandarochoa@gmail.com

■ Submetido: 07/05/2018; Revisado: 23/01/2019; Aceito: 13/08/2019.

are elements impacted by this fact, since the coding and recollection of information occurs more effectively and faster when the mood is depressed (Pergher et al., 2006). In a study by Ellis and Moore (1999), hypotheses were tested to ensure the recollection processes of mood-related episodic memory, influencing mnemonic performance, as the performance of participants with depressed mood was considerably lower in relation to participants with normal or cheerful mood.

There are commitments understood as normal to the healthy aging of the human being, since studies have shown differences between young adults and the elderly in activities related to working memory, episodic memory and prospective memory (Yassuda et al., 2006; Zibetti et al., 2010; Haynes et al., 2016). Thus, it is clear that the current research commitment to a greater focus refers to the investigation of various memory processes (Carvalho et al., 2009; Chariglione & Janczura, 2013; Hamdan & Corrêa, 2009; Haynes et al., 2016; Pike et al., 2018), which suffer a gradual decline, along with learning skills. It is possible to analyze memory by separating it into short and long term, in which the second classification is divided between non-declarative and declarative, the latter being episodic memory, the focus of the current study, and semantic memory (Sternberg, 2010).

Episodic memory is related to the capacity to store and evoke events. It is classified from the perspective of content memory and its formation encompasses several processes, including the coding of information, the retention of acquired data and the recollection of already consolidated knowledge (Pinto, 2004; Mahr & Csibra, 2018; Huo et al. 2018). Studies in this area have obtained significant collaboration by Tulving and Markowitsch (1998), who characterized episodic memory through the concept of memories of lived experiences, that is, referring to conscious memories of past experiences, which are not generalized to situations.

The decline related to episodic memory leads to a deficit in information storage, which may also be related to attentional aspects, flexibility of cognition and inhibitory processes, in addition to the fact that this phenomenon may cause a decline in other memory processes (Hamdan & Corrêa, 2009; Huo et al., 2018). Episodic memory performance may be impaired by factors related to depression, as observed in the study by Hamdan and Corrêa (2009) and factors linked to dementia, as discussed by Hamdan and Bueno (2005), which directly lead to a decrease of memory storage and mnemonic evocation.

The episodic memory performance measure in elderly people without cognitive impairment was considered satisfactory in a study by Carvalho et al. (2009), using the word categorization strategy. It was possible to observe that cognitive aspects can be recovered and developed in view of different learning strategies. It is in this context that cognitive interventions intertwine as a mediation between natural declines and the preservation of elderly cognitive development.

Cognitive interventions aim at enhancing and safeguarding functions, so that these are favorable to well-being, quality of life and longevity (Morando et al., 2018). Thus, they can provide the elderly with awareness about the relationship between their cognitive reserve and their remaining cognitive abilities, resulting in a positive change in their self-concept and autonomy (Irigaray et al., 2012; Chariglione & Janczura, 2013; Dias & Lima, 2012; Santos & Flores-Mendoza, 2017; Gomes, 2019).

From the general proposals of cognitive interventions, two categories will be presented here, used in a comparative way in this study - cognitive stimulation and cognitive training. Cognitive stimulation has, as its main objective, the improvement of cognitive and social functions, through standardized activities performed repeatedly, such as memorization, categorization, and recollection activities, where there is no use of specific strategies during the intervention. These activities can be performed in groups or individually (Mowszowski et al., 2010; Chariglione, 2014; Santos & Flores-Mendoza, 2017). In a survey conducted by Dias and Lima (2012), it was pointed out that the scarce cognitive stimulation, together with the expected changes related to aging, corroborates that some aspects of memory quickly deteriorate over the years, something that could be delayed with this type of intervention.

In cognitive training, a number of studies (Carvalho et al., 2009; Chariglione & Janczura, 2013; Irigaray et al., 2012; Belleville et al., 2017; Pike et al., 2018) point out that this type of intervention has been favorable to the elderly in relation to learning regarding the proposed mnemonic strategies, in addition to being recognized, in recent years, as a type of intervention with crucial potential in relation to the protection against cognitive decline. The training is performed through strategies guided by the skills of the participants, proposing several tasks that reflect on specific cognitive functions (Mowszowski et al., 2010). This type of intervention began to be studied in Brazil by Wood et al. (2000), and applied nationwide at a late stage, since, internationally, cognitive training has been studied since the 1980s (Santos & Flores-Mendoza, 2017).

Memory training proposes strategies that can be classified as unifactorial or multifactorial (Chariglione, 2014; Raymundo et al., 2017; Santos & Flores-Mendoza, 2017). Its realization varies according to the duration, the format (individual or group) and the structure (Olchik et al., 2012). It is agreed in the national and international literature that the training that presents the best performance and results is the one performed in groups, due to motivational stimuli and sharing of experiences. The number of sessions varies, lasting longer than five times, with an average of weekly sessions, with the training session lasting between an hour and a half and two hours (Carvalho et al., 2009; Olchik et al., 2012; Santos & Flores-Mendoza, 2017; Belleville et al., 2017). The elderly who performed this type of intervention demonstrated that they learned the strategies

applied to situational activities during the training, however, they express difficulty in applying the same strategies in their daily lives. It is found that the effect of training lasts, on average, from six months to one year (Carvalho et al., 2009; Olchik et al., 2012).

Considering the limitations, it is also important to emphasize that the training directly stimulates the notion of brain plasticity due to the approximation between the current performance and the maximum possible performance (Carvalho et al., 2009; Olchik et al., 2012; Santos & Flores-Mendoza, 2017; Morando et al., 2018). Training can take place through strategic activities, such as goal planning, association of names and faces, the Loci method, and mind

mapping. In a study by Cotta et al. (2012), it was observed that variables such as education and age may corroborate the results regarding the performance of episodic memory, however, the literature lacks studies with larger samples.

In view of the aforementioned information, this article aims to relate the changes in episodic memory in the elderly who attended two different cognitive intervention groups (stimulation and training), in two moments (pre- and post-intervention) with episodic memory and mood states measures. Thus, it is intended to investigate such processes so that it is possible to contribute scientifically to the improvement of the cognitive quality of life of the elderly and to further contribute to existing research.

METHOD

This is a quasi-experimental study with pre- and post-intervention, and cross-sectional assessments. With a duration of 24 months, the project was submitted and approved by the Research Ethics Committee, *Certificado de Apresentação para Apreciação Ética* (CAAE, Presentation Certificate for Ethical Appreciation) number: 67653517.4.3001.5553, respecting the rules of the National Research Commission of the Ministry of Health. All participants signed an Informed Consent Form.

Participants

The final sample consisted of 46 elderly people, from the 85 who initially enrolled in the project. The group had an average age of 68.7 years ($SD = \pm 6.82$), ranging between 60 and 88 years old. The study included elderly people with or without cognitive impairment, residents

of the Federal District (the capital of Brazil), of both sexes. Individuals with visual, auditory, or motor deficits that precluded their understanding and execution in the assessments and interventions were excluded; individuals who had been under general anesthesia in the past six months; and, still, those with presence or history of psychiatric disorders, neurological diseases, alcoholism or use of illicit drugs.

Throughout the procedure steps of the research, the phenomenon of sample loss was noted. The participants presented different reasons for dropping out, such as the incompatibility of schedules in relation to the meetings, health adversities and motivational issues regarding the research. This process can be seen in Figure 1.

At the end of the cognitive interventions, the sociodemographic profile of the sample of each intervention group was drawn. Such information can be seen in Table 1.

Table 1

Sociodemographic variables of the final post-intervention sample

Variável	MEMO (n = 25)	Stimulus (n = 24)
Age	69.98 (60-88)	67.67 (60-83)
Gender		
Female	21 (84.00%)	18 (85.71%)
Male	04 (16.00%)	03 (14.29%)
Educational level		
Incomplete elementary school	8 (32.00%)	6 (28.57%)
Complete elementary school	2 (8.00%)	3 (14.28%)
Incomplete high school	2 (8.00%)	1 (4.76%)
Complete high school	7 (28.00%)	7 (33.33%)
Some university-level	2 (8.00%)	0 (0.00%)
University-level Education, with degree	4 (16.00%)	4 (19.04%)

Note. Age variable represented by means and intervals in parentheses; sex and educational level variables represented by their frequencies, with the percentage in parentheses.

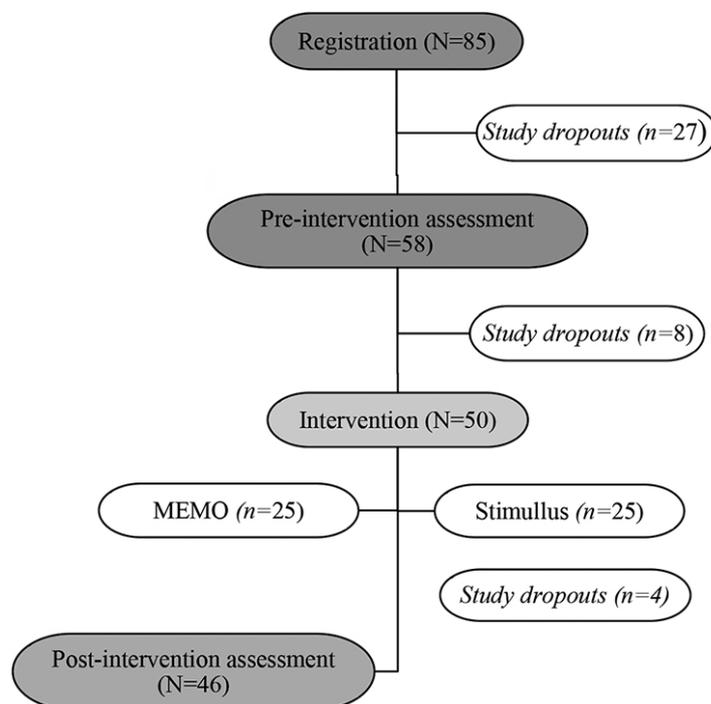


Figure 1. Participant allocation process.

Instruments

For this study, the instruments were divided into three categories: diagnostic tests, which are necessary instruments for the collection of sociodemographic data, as well as the assessment of the health conditions and lifestyle of the participants; memory test, which is useful to trace the subjects' mnemonic performances within the scope of what is assessed in the research; and, finally, materials from cognitive interventions, which refer to cognitive stimulation, using the *Stimulus* procedure and, in cognitive training, using the MEMO procedure.

Diagnostic Tests

For the sample profile to be methodically observed, applications of diagnostic tests were necessary to better understand the sample design. From that, two instruments of analysis were used – the Anamnesis and the *Escala de Depressão em Geriatria* (EDG, Geriatric Depression Scale).

The Anamnesis consists of a questionnaire to collect sociodemographic information, such as age, sex, educational level, and aspects associated with general factors and relevant information about the participants and their lifestyles.

The EDG is an instrument consisting of 30 items, prepared by Yesavage et al. (1983) and adapted for the

Brazilian population by Almeida and Almeida (1999), currently composed of 15 items, with the objective of identifying the presence or absence of depressive symptoms in the elderly. The score ranges from zero to 15 points, where scores below six are considered normal, to the point that a score equal to or greater than six may indicate symptoms of depression.

Memory Test

To assess the notions that refer to the field of memory, a test that mentions the focus of this study, episodic memory, was used. The Rey Auditory-Verbal Learning Test (RAVLT) is useful in the perception of verbal memory deficit. It was developed by Rey in 1958, and adapted and standardized for several countries, including Brazil – adapted by Malloy-Diniz et al. (2000). The test consists of 15 nouns (list A), these are read aloud to the participant, with an interval of one second between words, with consecutive repetition of five times, with each attempt followed by spontaneous evocation. After the fifth attempt, the interference list (list B) is presented, also composed of 15 nouns, which are followed by a single spontaneous evocation. Soon after, the list A nouns are asked to be evoked, without their previous reading. After an interval of 20 minutes, it is requested again that the list A nouns are evoked without re-reading them. In

this instrument, it is possible to assess the learning curve, the proactive interference index, the retroactive interference index, and how fast the participants forgot words (Cotta et al., 2012).

Cognitive Interventions

The instruments described in this section are detailed according to the order in which they were presented in each training, following the guidelines by Chariglione (2014). In addition to the material discussed and presented in the training, an exercise list (relevant to the theme) to be done as “homework” was given to the participants after each session.

The stimulation type intervention, herein called *Stimullus*, was administered to the participants with the following order: 1) Visual sequence: stories composed of sets of images are presented for the identification by the participants, using the episodic memory attention processes; 2) Memorization of words: sets of words are presented, divided into four categories of difficulty, and have to be mnemonically evoked by the participants; 3) Memorization of phrases: 30 phrases are arranged, organized into three categories of difficulty, with ten phrases each, which have to be evoked by the participants; 4) Image categorization: 192 words are presented, with each category having 24 distracting words and 24 target words, in order for participants to classify them into “yes” or “no”, focusing on short-term memory and episodic memory; 5) Memorization of images: similar to the previous step, 80 figures are now presented, to be classified as “yes” or “no”; and 6) Memorization of stories: three activities, consisting of stories (logical memory), arithmetic operations (executive functions) and figures for the “game of seven errors” (divided attention) (Chariglione, 2014).

The training-type intervention, here called MEMO, was administered to participants with the aid of a data projector in all sessions, through the following order: 1) Memory and aging: the different memory classifications are presented. Brain functions related to attention and writing are involved, since participants use notepads and pencil for taking notes; 2) The importance of being attentive: different types of attention are presented. The brain functions involved are, through printed activities, divided attention, involving implicit and explicit memory; 3) Mental image training: mental images related to memorization strategies are worked on, using printed activities on mental image strategies with single pictures and pairs of pictures; 4) The Loci method: exercises are used so that the participants use their attention and memory to make a familiar trajectory with the Loci method of construction and classification, and training with their shopping lists; 5) The name-face association method: using attention, memory and executive functions, participants are encouraged to identify distinctive facial features and associate them with names, and then later recollect this information; and 6) The *Primeira*

leitura, Releitura, Sumário e Teste (PRST, First reading, Rereading, Summary and Test): using a printed exercise for the participants to use the PRST technique based on the reading of three small texts (Chariglione, 2014).

Procedures

This study lasted a total of six consecutive months. First, the process of recruiting and selecting participants was initiated. At this stage, the research was disseminated in environments frequented by community residents, such as the basic healthcare units in the Federal District and the Elderly Community Center of the university. Pre-registration was carried out individually, and contact was made via telephone, proposing the interested parties to participate in the research presentation.

Based on the organization of the research team, a group meeting of the interested parties was held in order to welcome and present the research to the public, together with the presentation of the activities that were to be carried out and their schedule. At the end of the reception, which took place in the auditorium of one of the buildings of the university, and which lasted approximately one hour, the participation of each person was confirmed, and registrations were carried out.

Pre-Intervention

At this point, the then 58 participants were distributed among the research team, so that the days and times of application of the diagnostic tests and memory tests were congruent to both participants and assessors. The tests were carried out by two neuropsychologists, including four more research assistants. The tests of this specific study were applied, in addition to the tests of the basic research - “Assessment of two memory interventions in physiological, cognitive and mood measures in elderly people of the Federal District, Brazil”, also characterized by diagnostic tests and memory tests.

Participants were assessed individually, in a single session, lasting an average of 60 minutes. The completion of the applications of such tests took place within 30 days prior to the beginning of the application of the interventions, so that there would be no impediment to the process. The tests, both diagnostic and memory (Anamnesis, EDG and RAVLT), were oral ones, with the answers being marked on answer sheets and then tabulated in the online research documents by the same neuropsychologists and research assistants.

Cognitive Intervention

The analysis of the inclusion and exclusion factors, defined above, was made based on the assessment of pre-intervention measures; thus, the participants were split by block randomization between two intervention groups,

Stimulus and MEMO, each containing 25 participants, of both sexes – eight people dropped out in the period between the assessment and the cognitive intervention.

The interventions took place over a period of six weeks, with weekly meetings lasting approximately one hour and thirty minutes. Both groups were led by a neuropsychologist, together with the support of at least two research assistants.

The structure of each session was standardized in both intervention groups, and the content of the session from the previous week was revised, so that the exercise the participants had to do at home would also be subsequently reviewed. Then, the themes of each session were exposed, deepening into them, carrying out exercises, reviewing the contents and prescribing the exercises to be carried out at home.

Post-Intervention

In the last stage, the same procedure of the pre-intervention assessment was applied, with the insertion of the follow-up regarding the Anamnesis. It took place within 30 days after the application of cognitive interventions.

Data analysis

After their collection, the data regarding the diagnostic and memory tests were duly tabulated and statistically analyzed with the aid of a statistical computer software.

Tests were performed against the normality curve (Shapiro-Wilk test), in relation to the memory test and the scores of the diagnostic tests variables, and later, parametric and non-parametric tests were applied, depending on the normality of the variable. Thus, the assessment measures were compared based on mean, standard deviation and level of significance values adopted in the statistical tests of this research, being 5%.

In the analysis that correlates the measures of the variables referring to the domains worked in the RAVLT memory test with the intervention groups, the t-test of independent samples was used. This test was useful as it compares independent variables from two groups, with a sample greater than 30, and does not necessarily require a sample of normal data.

In relation to the comparison between the pre- and post-intervention data, based on the variables indicated in the RALVT memory test, the Shapiro-Wilk normality test was performed at both assessment moments. To the normality variables, the parametric analysis of the paired t-test was performed, and to the non-normality variables, the Wilcoxon non-parametric test was applied.

Regarding the EDG and the RAVLT recognition memory test variables, the level of significance between the two assessment moments was analyzed using the Wilcoxon non-parametric test, due to the non-normality in face of the sample obtained.

RESULTS

The analysis of the results was carried out with the use of memory and diagnostic tests, with the respective objectives of assessing the memory measures of the total sample referring to the moments before and after the intervention, to assess the memory performance in different intervention groups, and also, measure the scores related to mood states in the pre- and post-intervention moments.

Table 2 shows the relationship of the memory test variables from the pre- and post-intervention moments, considering the total sample of the study, since it aims to investigate whether

there were gains in memory for the elderly, regardless of the type of cognitive intervention they had.

The results of the variables are presented through the comparison between mean scores, standard deviation, and analysis of the level of significance. In relation to the results of the Learning Curve, the level of significance between the assessment moments demonstrated that there was a significant difference in relation to this variable ($p = 0.000$), with a unique result in Table 2, since the p values of the other memory test variables showed no significant difference. The

Table 2

RAVLT Memory Test Measures of the Total Sample in the Pre- and Post-Intervention Moments.

Variable	Pre-intervention		Post-intervention		p
	Mean	Standard Deviation	Mean	Standard Deviation	
Learning Curve	37.74	± 9.36	42.37	± 10.48	0.000
S. of Forgetting ^a	1.08	± 0.53	1.01	± 0.23	0.472
PI ^b	1.15	± 0.64	0.93	± 0.38	0.073
RI ^c	0.70	± 0.23	0.78	± 0.23	0.095
Recognition	11.65	± 3.61	12.63	± 2.80	0.100

Note. For the non-normality variables, the Wilcoxon test was performed; the paired t-test was performed for the normality variables.

^a Speed of Forgetting. ^b Proactive Interference Index. ^c Retroactive Interference Index.

Learning Curve is conceptualized as a measure related to the performance in the recollection of words over the duration of the test, and, through this, it is possible to obtain the short-term memory measure, through the total count of evoked words, with scores ranging from zero to 15 words (Cotta et al., 2012). It is possible to observe that there was an increase in the average value, when comparing the second moment in relation to the first one, which indicates the extension of the Learning Curve in the post-intervention moment. The other variables showed no significant difference to the total sample referring to the pre- and post-intervention moments.

Table 3 presents the measures of the memory test variables applied to the different intervention groups.

The result of the memory test variables showed small differences in their scores, since there was no significant difference between the groups at the time of post-intervention assessment. It is possible to verify this statement by observing the p values, since ($p > 0.05$) in the analysis of all variables between groups.

In reference to the mean and standard deviation values of the Speed of Forgetting variable, it is possible to note

that the cognitive training group (MEMO) had a greater speed in relation to forgetting the words and higher rates of proactive and retroactive interference, when compared with the cognitive stimulation group (*Stimulus*). On the other hand, the training group recognition scores were slightly higher in relation to the stimulation group.

Table 4 shows the relationship between the mood and recognition measures of the memory test, in the pre- and post-intervention moments. Such variables were used in order to link the data related to mood states and memory, these through the recognition variable, which measures the level of verification of the words used in the test, being related to the overall performance of episodic memory.

The result of EDG in the pre- and post-intervention moments expressed a significant difference between such moments, since $p=0.049$. Thus, it is possible to observe that the mood states of the elderly in the post-intervention moment were lower in relation to the pre-intervention moment, indicating that, among the general group, there was a decrease in the levels of depressive mood.

Table 3

RAVLT Memory Test Measures in Different Types of Intervention.

Variable	Group				p
	<i>Stimulus (n = 21)</i>		MEMO (n = 25)		
	<i>Mean</i>	<i>Standard Deviation</i>	<i>Mean</i>	<i>Standard Deviation</i>	
Learning Curve	43.33	± 9.35	41.56	± 11.48	0.574
S. of Forgetting ^a	0.99	± 0.19	1.04	± 0.26	0.460
PI ^b	0.89	± 0.38	0.96	± 0.38	0.512
RI ^c	0.78	± 0.20	0.77	± 0.26	0.913
Recognition	12.24	± 3.79	12.96	± 1.56	0.390

Note. The assessment in question was carried out after cognitive interventions.

^a Speed of Forgetting. ^b Proactive Interference Index. ^c Retroactive Interference Index.

Table 4

Geriatric Depression Scale (EDG) and RAVLT Recognition Test Measures.

Variable	Pre		Pós		p
	<i>Mean</i>	<i>Standard Deviation</i>	<i>Mean</i>	<i>Standard Deviation</i>	
EDG	4.28	± 2.89	3.59	± 3.22	0.049 ^a
Recognition	11.65	± 3.61	12.63	± 2.80	0.100 ^a

^a Wilcoxon Test.

DISCUSSION

The results obtained in this research were related to the performance of episodic memory in different cognitive intervention groups, in addition to the analysis of mood states in pre- and post-intervention assessments. The intervention groups were divided into two, one with cognitive stimulation and the other with cognitive training. Assessments were

performed before and after the interventions, with diagnostic tests and memory tests, so that the research hypotheses were properly verified.

In this study, the focus was to verify whether the measures of the episodic memory test variables had significantly changed in relation to the period between

assessments; among the groups, which had the greatest effect on the memory test variables; and on mood states and memory tests, if there were significant changes between the two assessment moments.

Regarding the first focus of the research, it is possible to observe that the post-intervention assessment showed increasing and significant changes in relation to the pre-intervention assessment, in context with the variables of the RAVLT memory test. The RAVLT is an effective tool in identifying processes that enhance the retention of new information (Cotta et al., 2012), and from it, the total sample demonstrated a greater degree of learning during the interventions, a fact that indicates that both groups (stimulation and training) obtained gains regarding the learning methods used during cognitive interventions and had positive considerations in relation to cognitive reserves (Gomes, 2019). This result corroborates with studies by Raymundo et al. (2017) and Zokaei et al. (2017) that reflect on the beneficial impact of cognitive interventions, regardless of their methodological line, on the quality of life of the elderly.

The relationship between the Proactive Interference Index (PI) and Retroactive Interference Index (RI) variables in the pre- and post-intervention moments was shown in the decreasing the mean values in both variables. This indicates that, in general, individuals had the ability to distance from distracting elements, even if briefly, and this fact contributed to the development of memory performance in the sample.

Regarding the cognitive intervention groups, they were analyzed based on the RAVLT variables. From the analysis of the data obtained, it is possible to observe that both groups achieved some level of cognitive development during the interventions. The improvement or maintenance of cognitive functions developed during the intervention is a phenomenon that converges with considerations made in a number of studies (Mowszowski et al., 2010; Santos & Flores-Mendoza, 2017), in which the authors defend the existence of a series of possible benefits arising from interventions, as these interventions provide potential for improvements in attention, memory, language and executive functions, in addition to social development within groups.

Based on the studies of Irigaray et al. (2012), Chariglione and Janczura (2013), and Gomes (2019), cognitive interventions, regardless of their format, stimulate cognitive and interpersonal gains for the elderly, in addition to stimulating their cognitive reserve capacity and brain plasticity. Still, it is important to highlight the gains related

to the self-concept and current autonomy of this population, even though the results of these studies show that there is no long-term effect, longer than one year, after the completion of the cognitive training (Morando et al., 2018 ; Carvalho et al., 2009; Olchik et al., 2012).

Cognitive training showed better results regarding the memory test learning curve, and this fact can be based on the benefit derived from multifactorial techniques and more specific strategies, as mentioned in the studies by Cotta et al. (2012), Carvalho et al. (2009) and Belleville et al. (2017). Thus, cognitive training had higher scores, however, data were not sufficient to confirm the priority for this intervention model in future studies.

Regarding the analysis of mood states, the EDG and the RAVLT recognition test scores were compared in the pre- and post-intervention moments, and a significant difference was identified between the moments in terms of depression levels. Thus, the decrease in the general depression score is not directly related to the performance of episodic memory, as found in the studies by Ellis and Moore (1999) and Pergher et al. (2006). From this result, it appears that the decrease in depression levels may have been influenced by factors considered convenient to the research subjects, as pointed out in studies by Carvalho et al. (2009), Olchik et al. (2012), Santos and Flores-Mendoza (2017), Belleville et al. (2017) and Mowszowski et al. (2010), regarding the environment of inclusion in the intervention groups, which are conducive to the development of interpersonal relationships, motivational stimuli and exchanges of personal experiences. Still, in these studies, the relevance of activities that stimulate the main cognitive functions is highlighted, in context with the elderly people's life experiences.

In view of these results, it is observed that the importance of memory interventions for elderly people is of relevant importance for enhancing their quality of life, with regard to autonomy, as agreed by Carvalho et al. (2010), also regarding their mood and coexistence in interpersonal relationships.

Among the possible limitations of the study, it is necessary to highlight that the sample was relatively homogeneous in terms of sex, while moderately different in terms of educational level. Thus, it is necessary to apply the same methodology to larger and more heterogeneous samples, while also being important to encourage the continuity of this research, with a possible longitudinal study, with the purpose of verifying episodic memory performance in relation to the types of cognitive intervention over a longer and more detailed periodicity.

REFERENCES

- Almeida, O. P., & Almeida, S. A. (1999). Confiabilidade da Versão Brasileira da Escala de Depressão em Geriatria (GDS) [Reliability of the Brazilian Version of the Geriatric Depression Scale (GDS) Short Form]. *Arquivos de Neuro-Psiquiatria*, 57(2B), 421-426. <http://dx.doi.org/10.1590/S0004-282X1999000300013>
- Belleville, S., Hudon, C., Bjer, N., Brodeur, C., Gilbert, B., Grenier, S., Ouellet, M. C., Viscogliosi, C., & Gauthier, S. (2017). MEMO+: Efficacy, Durability and Effect of Cognitive Training and Psychosocial Intervention in Individuals with Mild Cognitive Impairment. *Journal of the American Geriatrics Society*, 66(4), 655-663. <https://doi.org/10.1111/jgs.15192>
- Carvalho, F. C. R., Neri, A. L., & Yassuda, M. S. (2009). Treino de Memória Episódica com Ênfase em Categorização para Idosos sem Demência e Depressão [Episodic Memory Training with Emphasis on Categorization for Older Adults Without Dementia and Depression]. *Psicologia: Reflexão e Crítica*, 21(2), 317-323. <http://dx.doi.org/10.1590/S0102-79722010000200014>
- Chariglione, I. P. F., & Janczura, G. A. (2013). Contribuições de um Treino Cognitivo para a Memória de Idosos Institucionalizados [Contributions of a Cognitive Training for the Memory of Institutionalized Elderly]. *Psico-USF*, 18(1), 13-22. <http://dx.doi.org/10.1590/S1413-82712013000100003>
- Chariglione, I. P. F. (2014). *Intervenções Cognitivas para o Aprimoramento da Memória em Idosos com Envelhecimento Cognitivo Normal* [Cognitive Interventions for Improving Memory in Elderly People with Normal Cognitive Aging]. [Doctoral Dissertation, University of Brasilia]. University of Brasilia Repository <https://repositorio.unb.br/handle/10482/16137>
- Cotta, M. F., Malloy-Diniz, L. F., Nicolato, R., Moares, E. N., Rocha, F. L., & de Paula, J. J. (2012). O Teste de Aprendizagem Auditivo-Verbal de Rey (RAVLT) no diagnóstico diferencial do envelhecimento cognitivo normal e patológico [The Rey Auditory-Verbal Learning Test (RAVLT) on the Differential Diagnosis of Normal and Pathological Aging]. *Contextos clínicos*, 5(1), 10-25. <http://doi.org/10.4013/ctc.2012.51.02>
- Dias, M. S., & Lima, R. M. (2012). Estimulação Cognitiva por Meio de Atividade Física em Idosas: Examinando uma Proposta de Intervenção [Cognitive Stimulation Through Physical Activity in Older Women: Examining an Intervention Proposa]. *Revista Brasileira de Geriatria e Gerontologia*, 15(2), 325-334. <https://doi.org/10.1590/S1809-98232012000200015>
- Ellis, H. C., & Moore, B. A. (1999). Mood and Memory. In T. Dalgleish, & M. J. Power (Eds), *Handbook of Cognition and Emotion* (p. 191-210). John Wiley & Sons. <https://doi.org/10.1002/0470013494.ch10>
- Gomes, A. S. A. (2019). *Relação entre reserva cognitiva e funções executivas: estudo piloto numa amostra de idosos*. [Master's Thesis, Universidade Portucalense Infante D. Henrique]. Universidade Portucalense Repository. <http://hdl.handle.net/11328/2618>
- Haynes, B. I., Kliegel, M., Zimprich, D., & Bunce, D. (2016). Intraindividual Reaction Time Variability Predicts Prospective Memory Failures in Older Adults. *Aging, Neuropsychology, and Cognition*, 25(1), 132-145. <https://doi.org/10.1080/13825585.2016.1268674>
- Hallgren, J., Reynolds, C., Pedersen, N., Fransson, E.I., Finkel, D., & Dahl, A. K. (2018). Cognitive Trajectories in Relation to Hospitalization Among Older Swedish Adults. *Archives of Gerontology and Geriatrics*, 74, 9-14. <https://doi.org/10.1016/j.archger.2017.09.002>
- Hamdan, A. C., & Bueno, O. F. A. (2005). Relações entre Controle Executivo e Memória Episódica Verbal no Comprometimento Cognitivo Leve e na Demência Tipo Alzheimer [Relationships Between Executive Control and Verbal Episodic Memory in the Mild Cognitive Impairment and the Alzheimer-Type Dementia]. *Estudos de Psicologia*, 10(1), 63-71. <https://dx.doi.org/10.1590/S1413-294X2005000100008>
- Hamdan, A. C., & Corrêa, P. H. (2009) Memória Episódica e Funções Executivas em Idosos com Sintomas Depressivos [Episodic Memory and Executive Functions on Elders with Depressed Symptoms]. *Psico-UFPR*, 40(1), 73-80.
- Huo, L., Li, R., Wang, P., Zheng, Z., & Li, J. (2018). The Default Mode Network Supports Episodic Memory in Cognitively-Unimpaired Elderly Individuals: Different Contributions to Immediate Recall and Delayed Recall. *Frontiers in aging neuroscience*, 10(6), 2018. <https://doi.org/10.3389/fnagi.2018.00006>
- Irigaray, T. Q., Gomes Filho, I., & Schneider, R. H. (2012). Efeitos de um Treino de Atenção, Memória e Funções Executivas na Cognição de Idosos Saudáveis [Effects of an Attention, Memory and Executive Functions Training on the Cognition of Healthy Elderly People]. *Psicologia: Reflexão e Crítica*, 25(1), 188-202. <https://doi.org/10.1590/S0102-79722012000100023>
- Malloy-Diniz, L. F., da Cruz, M. D. F., Torres, V. D. M. & Cosenza, R. M. (2000). O Teste de Aprendizagem Auditivo-Verbal de Rey: Normas para uma População Brasileira [The Rey Auditory-Verbal Learning Test: Norms for a Brazilian Sample]. *Revista brasileira de neurologia*, 3(36), 79-83.
- Marh, J. B & Csibra, G. (2018) Why Do We Remember? The Communicative Function of Episodic Memory. *Behavioral and Brain Sciences*. <http://doi.org/10.1017/S0140525X17000012>
- Morando, E. M. G., Schmitt, J. C., & Ferreira, M. E. C. (2018). Treino de Memória em Idosos Saudáveis: Uma Revisão da Literatura [Memory Training in Healthy Elderly People: A Literature Review]. *International Journal of Developmental and Educational Psychology. Revista INFAD de Psicologia*, 4(1), 293-310.
- Mowszowski, L., Batchelor, J. & Naismith, S. L. (2010). Early Intervention for Cognitive Decline: Can Cognitive Training Be Used as a Selective Prevention Technique? *International Psychogeriatrics*, 22(4), 537-548.
- Olchik, M. R., Mattos, D., Maianeri, N.S., Farina, J., Oliveira, A., & Yassuda, M. S. (2012). Revisão: Efeitos do Treino de Memória em Idosos Normais e em Idosos com Comprometimento Cognitivo Leve [Review: Effects of Memory Training in Normal Elderly and Elderly with Mild Cognitive Impairment]. *Temas em Psicologia*, 20(1), 235-246.
- Pergher, G. K., Grassi-Oliveira, R., Ávila, L. M., & Stein, L.M. (2006) Memory, Mood and Emotion. *Revista de Psiquiatria do Rio Grande do Sul*, 28(1), 61-68. <http://dx.doi.org/10.1590/S0101-81082006000100008>
- Pinto, A. C. (2004). Diferenças de Sexo em Provas de Memória Operatória, Memória Episódica e Teste de Símbolos [Gender Differences in Operative Memory, Episodic Memory and Symbolic Tests Tasks]. *Psicologia, Educação e Cultura*, 8(1), 7-19.
- Pike, K. E., Chong, M. S., Hume, C.H., Keech, B. J., Konjarski, M., Landolt, K. A., Leslie, B. E., Russo, A., Thai, C., Visten, J. S., & Kinsella, G. J. (2018). Providing Online Memory Interventions for Older Adults: A Critical Review and Recommendations for Development. *The Australian Psychological Society*. 1-10. <https://doi.org/10.1111/ap.12339>

- Raymundo, T. M., Boligon, B., Canales, E.B., Nascimeto, M. X. C., & Bernardo, L. D. (2017). Treino Cognitivo para Idosos: Uma Estratégia Interventiva Utilizada pela Terapia Ocupacional [Cognitive Training for the Elderly: an Intervention Strategy Used by Occupational Therapy]. *Revista Ocupación Humana*, 17(2), 5-19. <https://doi.org/10.25214/25907816.168>
- Santos, M., & Flores-Mendoza, C. (2017). Treino Cognitivo para Idosos: Uma Revisão Sistemática dos Estudos Nacionais [Cognitive Training for Elderly: A Systematic Review of Brazilian Research]. *Psico-USF*, 22(2), 337-349. <http://dx.doi.org/10.1590/1413-82712017220212>
- Souza, V. L., Borges, M.F., Vitória, C. M. S., & Chiappetta, A. L. M. L. (2009). Perfil das Habilidades Cognitivas no Envelhecimento Normal [Profile of Cognitive Abilities in Normal Aging]. *Revista CEFAC*, 12(2), 186-192. <http://dx.doi.org/10.1590/S1516-18462009005000056>
- Sposito, G., Neri, A. L., & Yassuda, M. S. (2016). Atividades Avançadas de Vida Diária (AAVDs) e o Desempenho Cognitivo em Idosos Residentes na Comunidade: Dados do Estudo FIBRA Polo UNICAMP [Advanced Activities of Daily Living (AADLs) and Cognitive Performance in Community-Dwelling Elderly Persons: Data from the FIBRA Study - UNICAMP]. *Revista Brasileira de Geriatria e Gerontologia*, 19(1), 7-20. <http://dx.doi.org/10.1590/1809-9823.2016.15044>
- Sternberg, R. J. (2010). *Psicologia Cognitiva* [Cognitive Psychology] (5ª Ed.). Editora Cengage.
- Tulving, E., & Markowitsch, H. J. (1998). Episodic and Declarative Memory: Role of the Hippocampus. *Hippocampus*, 8(3), 198-204. [https://doi.org/10.1002/\(SICI\)1098-1063\(1998\)8:3<198::AID-HIPO2>3.0.CO;2-G](https://doi.org/10.1002/(SICI)1098-1063(1998)8:3<198::AID-HIPO2>3.0.CO;2-G)
- Wood, G. M. O., Araujo, J. R., Lima, E. P., Haase, V. G., Scalioni, I. G., & Sampaio, J. R. (2000). Desenvolvimento Cognitivo Adulto: A Avaliação e a Reabilitação da Capacidade de Memória de Trabalho [Adult Cognitive Development: Assessment and Rehabilitation of Working Memory Capacity]. In V. G. Haase, R. Rothe-Neves, C. Kappler, M. L. M. Teodoro, & G. Wood (Eds), *Psicologia do desenvolvimento: Contribuições interdisciplinares* (pp. 121-144). Editora Health.
- Yassuda, M. S., Batistoni, S. S. T., Fortes, A. G. & Neri, A. L. (2006). Treino de Memória no Idoso Saudável: Benefícios e Mecanismos [Memory Training in Healthy Elders: Outcomes and Possible Mechanisms of Improvement]. *Psicologia: Reflexão e Crítica*, 19(3), 470-481. <http://dx.doi.org/10.1590/S0102-79722006000300016>
- Yesavage, J., Brink, T., Rose, T., Lun, O., Huang, V., Adey, N. & Leirer, V. (1983). Development and Validation of a Geriatric Depression Scale: A Preliminary Report. *Journal of Psychiatric Research*, 17, 37-49.
- Zibetti, M. R., Gindri, G., Pawlowski, J., Salles, J. F., Parente, M. A. M. P., Bandeira, D. R., Fachel, J. M. G., & Fonseca, R. P. (2010). Estudo Comparativo de Funções Neuropsicológicas entre Grupos Etários de 21 a 90 anos [Comparative Study of Neuropsychological Functions Between Age Groups from 21 to 90]. *Revista Neuropsicologia Latinoamericana*, 2(1), 55-67.
- Zokaei, N., MacKellar, C., Cepukaityte, G., Patai, E.Z., & Nobre A.C. (2017). Cognitive Training in the Elderly: Bottlenecks and New Avenues. *Journal of cognitive neuroscience*, 29(9), 1473-1482. http://doi.org/10.1162/jocn_a_01080