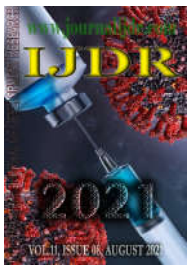
ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of Development Research
Vol. 11, Issue, 08, pp. 49491-49494, August, 2021
https://doi.org/10.37118/ijdr.22600.08.2021



RESEARCH ARTICLE OPEN ACCESS

CAPACITY OF LEXICAL ACCESS IN ELDERLY INDIVIDUALS LIVING WITH HIV VIRUS

Maria Fernanda Siqueira Houtet*[1], Viviane dos Santos Marques[1,2] Samya Laltuf de Oliveira[1], Marco Orsini[3,5], Carlos Henrique Melo Reis[3], Mauricio Sant' Anna Junior[4], Carlos Eduardo Cardoso[5], Acary Bulle Oliveira[6], Nathalia Carvalho Castellani[1] and Fernando Raphael de Almeida Ferry[1]

[1]Programa de Pós-Graduação em Infecção HIV/AIDS e Hepatites Virais – PPGHIV/HV - Universidade Federal do Estado do Rio de Janeiro – Unirio; [2]Universidade Veiga de Almeida – Graduação de Fonoaudiologia; [3]Escola de Medicina - Universidade Iguaçu e Programa de Mestrado em Neurologia – Universidade de Vassouras; [4]Instituto Federal do Rio de Janeiro – Escola de Fisioterapia; [5]Universidade de Vassouras; [6]Universidade Federal de São Paulo

ARTICLE INFO

Article History:
Received 06th May, 2021
Received in revised form
18th June, 2021
Accepted 09th July, 2021
Published online 29th August, 2021

Key Words:

Vocabulary; Memory; Speech therapy; AIDS serodiagnosis and HIV serodiagnosis.

Corresponding author:
Maria Fernanda Siqueira Houtet,

ABSTRACT

Introduction: HIV/AIDS frequently affects the Central Nervous System and may cause a cognitive decrease, and compromise the functions of working memory, especially the lexical access that affects the performance of daily activities. **Goal**: The purpose was to evaluate the ability of lexical access in seniors with HIV, in comparison with HIV-positive elderly. **Method and Methods**: Comparison of the performance of the experimental and control group, after the application of the Mini-Mental State Examination (MMSE) and the Verbal Fluency Test (VFT) aFnd analysis of the correlation of TCD4 lymphocyte count, time of diagnosis and time using ART. This research was approved by the REC with opinion number 1000359. **Results**: The elderly with HIV/AIDS had a lower performance with statistical significance in the MMSE tests, obtaining an average score of 25.6 when compared to the control group that obtained the score of 27.6 and VFT. The average was 15.9 points for the experimental group and 18.1 for the control, showing a worse performance in lexical access in the HIV group. When correlating the tests with the TCD4 lymphocyte rate with the MMSE, they showed significance for improved performance and the shorter the time of diagnosis, the higher the scores. **Conclusion**: The low performance in the lexical access capacity of the experimental group when compared to the control group reinforces the importance of assessing and intervening early in cognitive functions to maintain the independence and quality of life of the elderly with HIV/AIDS.

Citation: **Maria Fernanda Siqueira Houtet, Viviane dos Santos Marques Samya Laltuf de Oliveira, Marco Orsini, Carlos Henrique Melo Reis, Mauricio Sant' Anna Junior, Carlos Eduardo Cardoso, Acary Bulle Oliveira, Nathalia Carvalho Castellani and Fernando Raphael de Almeida Ferry. 2021.** "Capacity of lexical access in elderly individuals living with HIV virus", *International Journal of Development Research*, 11, (08), 49491-49494.

INTRODUCTION

AIDS (acquired immunodeficiency syndrome) appeared worldwide between 1977 and 1978, when the first cases were recorded in the USA, Central Africa and Haiti[1,2]. In Brazil, the first case appeared in São Paulo in 1980 and was only classified in 1982, when the new syndrome, AIDS[3], was officially defined.Human acquired immunodeficiency syndrome (AIDS) is caused by two lentiviruses: human immunodeficiency virus types 1 and 2 (HIV-1 and HIV-2). Both are the result of multiple interspecies transmissions of viruses found in African primates. Thus, it is clear that HIV-1 and HIV-2 were the result of the transfer of viruses infecting primates in Africa[4]. HIV infection is characterized by the destruction of TCD4+ lymphocytes (LT-CD4+) and continuous viral replication. In view of this, there is a suppression of the immune system, which favors the appearance of opportunistic infections[5], until reaching the last stage of the infection, which is AIDS, represneting one of the serious public health problems[6]. The manifestation of AIDS in the elderly is a growing problem in Brazil and reinforces the need to establish public policies for the prevention, early diagnosis and appropriate clinical treatment of this group[6].With the advance of the disease, there are

several clinical manifestations, such as degeneration of the central nervous system, muscle hypotrophy, and malignant processes[7], with this, the appearance of speech-language disorders in these individualsalso occurs, among these neurocognitive disorders, affecting the superior mental functions, such as language, attention, memory, perception, emotion and thought[8]. Speech therapy as a health science deals with issues relevant to mental functions and their repercussions on language, cognition and speech. A prevalent complaint in the elderly in general are the difficulties of memory and lexical access, which refers to the search for words existing in our mental vocabulary, called lexicon, which sometimes affects their communication, their daily activities and consequently the quality of life[9,10]. HIV infection often affects the Central Nervous System (CNS). Studies report that this infection occurs in the first years of virus infection, due to the tropism of the virus by the CNS, which replicates and releases the virions (viral particle outside the cell) in the cerebral parenchyma[11-13]..The virus uses infected macrophages and manages to cross the blood brain barrier, which functions as a kind of filter, which authorizes or denies the entry of certain substances into the CNS. Once inside the SN, the virus infects glial cells, which ultimately secrete neurotoxins, leading to neuronal damage and death[14,15]. Although the use of highly active antiretroviral therapy (HAART) has resulted in a remarkable decline in infectious conditions, morbidity and mortality in AIDS patients, it is not so efficient in the nervous system, because the main antiretrovirals have insufficient or zero access to the CNS, due to the presence of the blood brain barrier, making the brain more susceptible to HIV infection[16,17]. The agreement of the main neurological disorders described in the literature on cases of HIV dementia are: visuospatial memory loss, loss of visuomotor coordination, forgetfulness, difficulty concentrating and attention, slow thought, including understanding and processing and verbal memory deficit[11,18]. Neurocognitive disorders associated with HIV vary among HIV-positive individuals, according to the stage in which they are, whether symptomatic or asymptomatic. They are more frequent in the symptomatic population, usually manifested by altered memory, concentration and low processing speed, possibly associated with sensory neuropathy and muscle disorders[19-21]. Taking into account that the treatment of HIV/AIDS has been evolving over the years, since its initial description, the improvement in treatment has led to a significant increase in the life expectancy of individuals with the virus, developing the need to investigate the difficulties related to aspects of language,memory and lexical access, because they directly affect the performance of activities of daily living, treatment adherence, and consequently may impair patients' quality of life[22].

MATERIAL AND METHODS

This is a descriptive, cross-sectional, quantitative study, the main objective was to investigate the influence of the HIV virus on the performance of cognitive function, through the assessment of lexical access capacity. The participants were 40 elderly people recruited for the experimental group and 40 recruited for the control group.In the recruitment of the experimental group, we selected the elderly aged over 60 years, HIV carriers, who were under follow-up at the Immunology Service of the Gaffrée and Guinle University Hospital, who were clinically basal, that is, without manifestation of opportunistic diseases and/or other clinical alterations.In the control group, healthy elderly from the Elderly Group, with HIV-negative serology, were recruited, obtained through HIV testing, performed at the Hospital's AIDS Testing Center. Among the inclusion criteria for the two groups evaluated were, of both sexes, with similarity in the mean age and years of schooling. In the experimental group with HIV, the average of the clinical information collected from medical records was added, such as: time of diagnosis, CD4 T lymphocyte count and time of use of antiretroviral treatment (ART).The following cognitive tests were applied: Mini Mental State Examination (MMSE), which is a fast and recognized instrument for the screening of cognitive deficits. The verbal fluency test (VFT) semantic category, which evaluates the cognitive executive functions of language and semantic memory, especially the ability and agility of access to the mental lexicon, for the application of this test, a stopwatch was used to control the time of 1 minute required by the test. For statistical analysis, the Mann-Whitney U test was used for the correlations. A significance level of $\alpha = 0.05$ was considered, and the difference was considered significant when the p-value was below α. Pearson's correlation coefficient was used in the correlations between the parameters analyzed in the group of patients with HIV, which is the measure of the relationship between two numerical characteristics. This research was approved by the Research Ethics Committee of the Gafreé Guinle University Hospital, with the opinion number 1000359.

RESULTS

In this study, a convenience sample was used, and 80 patients were evaluated, 40 diagnosed with HIV infection, who were clinically stable, and who proposed to participate and 40 elderly people with HIV-negative serology, according to the inclusion criteria for analysis. Of these, n= 62 were female (77.5%) and n=18 males(22.5%).The age of the individuals varied between 60 and 88 years, with a mean age of 68.7 years, showing no differential significance between the groups for the p value. Regarding schooling, it was considered in years of schooling, comparing both groups but it does not show statistical significance when compared (Table 1). In the VFT, the most used category was selected, which is that of animals, because it is believed to be the least vulnerable to the variable schooling[23]. It is a test that evaluates the ability to evoke words under directed conditions, and the score corresponds to the total number of animal names produced in 1 minute, which is the focus of this study, to assess whether there was any difference in the performance, as shown in Table 1.

Table 1. Characteristics of the groups surveyed, distribution by education level and the tests applied

Variables	Control group (n=40)	HIV group (n=40)	P
Schooling (years)	10.2 ± 4.1	8.8 ± 3.7	ns
MMSE Test	27.6 ± 1.4	25.6 ± 2.8	<0.01
VFT Test	18.1 ± 4.2	15.9 ± 6.0	<0.02

MMSE – Mini Mental State Examination; VFT – The verbal fluency test.

Values were identified in the sample, demonstrating statistical significance in the results of comparation the application of the proposed cognitive tests and the MEEM as shown in Table 1. Regarding the specific variables of the experimental group, data were collected from medical records, based on the last examination performed up to the date of the interview, we obtained as a result for CD4, the mean nadir was 626.5 cel/mm3, with values of (SD±316.8) cel/mm3, of standard deviation. Only one patient presented CD4 <200 cel/mm3, representing 2.5% of the sample. We correlated CD4 with the MMSE (Figure 1A) significant differences were observed and, VFT tests to verify whether there would be an influence on the performance and no significant differences were observed. Regarding the time of diagnosis recorded in months, the mean was 174.6 months with standard deviation values of (± 69.8) months. This time was related to each test used in the sample to analyze the possibility of this variable influencing the expected normality values (Figure 1 B and Figure 1C). Regarding the treatment, the time of ART use was recorded in months, obtaining the respective means and standard deviation (140.1±69.4). The time of ART use was correlated with the tests performed to verify if there would be influence of this variable. However, in the Correlation Time of ART and Mini Mental, there was no correlation between the variables and in the correlation Time of ART and VFT there was a weak but significant correlation between the variables (Figure 1D).

DISCUSSION

In the present study, women prevailed in the global sample, for greater availability and female accessibility. Although there is a

higher incidence of HIV in males and the difference in incidence between the sexes has decreased substantially since the beginning of the epidemic[1], the influence of gender on cognition is less explored than the influence of age and schooling[24]. Age ranged from 60 to 88 years in both groups, maintaining a near mean age, according to the results, showing no statistically significant difference, which shows the compatibility of comparison, since this variable influences cognitive performance[25].Although the older age population represents a small proportion among HIV-positive patients, this group has progressively increased and tends to maintain this growth, since the survival of patients using ART is increasing, and there is a higher life expectancy of the general population[26].Population aging is a worldwide demographic phenomenon and from the biological point of view, aging is associated with a series of physiological changes and adaptations, which, despite presenting a change in relation to a previous pattern of functioning, do not necessarily represent pathological changes. A better understanding of these is necessary for more precise identification, aiming at the development of treatment strategies for these changes[27,28]. Schooling seems to have significant relevance in cognitive functioning, with the association of other variables such as lifestyle, participation in physical activities, eating, social engagement and neuronal development[25,29]. In our sample, individuals with more years of schooling were present in G1, and a little less in G2, but did not present a statistically relevant difference even when compared to the Values of VFT, as shown in table 3 attached.

From the analysis of the results found with the application of the MMSE test, when comparing the performance of the groups, G1 obtained scores between 25 and 30 points, all with an average above the cutoff point established for the Literate Brazilian population, according to Almeida[30], while G2 presented scores from 20 to 30 points, obtaining statistical significance of $p<0.01$, when comparing the performance of this group with G1 in this test. In another study from 2002, Brucki et al.[31] proposed suggestions for MMSE use in Brazil, presented schooling as a factor with the greatest influence on test performance and suggested that MMSE scores varied according to years of schooling, from 1 to 4 years (score of 20), 5 to 8 years (score of 25), 9 to 11 (score of 27), 12 years or older (score 28 and 29).In another study, conducted by Lourenço and Veras, in 2006[32], with 303 elderly people treated in general health outpatient clinics, they concluded that the best cutoff point for cognitive screening for illiterate individuals was 18/19 and for those with school education it was 24/25, which corroborated our cutoff point established for this study.However, it is necessary to make further studies, with a larger sample in the elderly population with HIV/AIDS in order to obtain greater specific scientific knowledge of this population studied and on the reliability of the established cutoff points. We also obtained $p<0.02$ value in the application of the VFT test when comparing the groups, answering the hypotheses of this research, suggesting that HIV infection predisposes elderly individuals to reduced lexical access, when compared to the elderly with HIV-negative serology.

The findings of verbal fluency suggest the interference in working memory, especially concerning phonological awareness, since the speed and accuracy in access to the mental lexicon are phonological processing skills[33], which refer to how information is processed, stored and used[33,34].Some indicators reveal that working memory plays an important role in the tasks that request phonological awareness, because, during the performance of a task of this nature, verbal material need to be kept in the working memory, in order to be successful in solving the requested task[35,36]. This cognitive screening signals the different results presented among the groups studied, which also suggests referral to other health services that can better elucidate the diagnosis of cognitive deficit and reaffirms the need for applying neurocognitive tests in their routine consultations and the value of multidisciplinary care to these patients,the verbal fluency test is recommended because it is a widely used test for screening cognitive deficits, dementia scans such as Alzheimer's dementia, neurological damage after cerebrovascular accident, since the execution of the task proposed in the test requires integrity of cognitive skills such as memory (semantics) and executive functions (selection and search)[29,37-42].The application of the VFT routinely can also enable early attention to cognitive issues and enable various therapeutic interventions, when verifying the effectiveness of cognitive stimulation and memory training, which can contribute significantly to the well-being of the elderly and their families, since they produce the maintenance of autonomy[10,43-46].This corroborates the design for this study, since the geriatric population and HIV/AIDS carrier present with a high chance of developing cognitive impairments. Regarding the specific variables of G2, the CD4 T rates were analyzed, with due knowledge of its influence on the general clinical status of these patients, when correlating their values with the verbal fluency test, no correlation was found. However, in relation to the MMSE test, there was moderate significance. This suggests that thinking of the best clinical condition promotes an improvement in cognition. In the analysis of the time of diagnosis with the tests, there was no correlation with the MMSE, but there was a weak and significant correlation between this variable and the VFT. The same happened when analyzing the correlation of the time of ART use with the tests, for the MMSE there was no correspondence, but there was a weak and significant influence on the verbal fluency test. For all these variables, except for the CD4 rate, it was measured in months (time of diagnosis and time of ART). Although statistically significant and relational results have been found, such data cannot be taken as absolute, as further studies are needed for real standardization. This research suggests that further studies with larger samples should be performed, especially in relation to secondary objectives, which was the correlation of the CD4 T lymphocyte, time of diagnosis and use of ART with VFT. We had a restricted sample in this study, seen the large number of patients that refused to be participants in the research, for personal reasons and mainly because they were investigated in numerous studies conducted in the immunology sector of the hospital and in addition to the difficulty of availability of the control group of volunteers and especially the refusal to have to take the HIV test, factors that limited the n of this study to 80 participants.

CONCLUSION

This study shows that patients aged over 60 years living with HIV followed up in HUGG's immunology service have good control of the disease, but with significant changes in lexical access and mini mental state examination when equating with the control group of the HIV-negative elderly, which reinforces the importance of this type of evaluation and other early speech-language interventions, language stimulation and cognition, in order to contain or delay possible cognitive declines. The research also suggests the need for further investigations of cognitive alterations in elderly patients with HIV/AIDS and studies with a larger sample for data consolidation.

REFERENCES

Allain P, Etcharry-Bouyx F, Verny C. Executive functions in clinical and preclinical Alzheimer's disease. Rev Neurol. 2013;169(10):695-708.

Alloway TP, Gathercole SE, Willis CE, Adams A. A structural analysis of working memory and related cognitive skills in young children. J Experim Child Psychol. 2004;7(87):85-106.

Almeida OP. Mini exame do estado mental e o diagnóstico de demência no Brasil. Arq Neuropsiquiatr. 1998;56(3B):605-12.

Araújo AQC, Prufer A, Novis SAP. Neuropatogenia do HIV. Rev Depart Educação Física Saúde Mestrado Promoção Saúde Universidade de Santa Cruz do Sul / Unisc. 2015;16(3)

Asega HL, Groschoski L, Oliveira LZ, Silva MM, Marques S, Carvalho TO. Envelhecendo com HIV: características clínicas, perfil de tratamento e riscos em pacientes de um hospital terciário. Rev Tendencias em HIV/AIDS. 2015;10(2):33-7.

Bell JE. An update on the neuropathology of HIV in the HAART era. Histopathology. 2004;45:549-59

Brasil. Ministério da Saúde. Departamento de DST, Aids e Hepatites Virais. Disponível em: http://www.aids.gov.br/pagina/historia-da-aids. Acess in: 20 Ago 2020.

Brasil. Ministério da Saúde. MS/SVS/Departamento de DST, AIDS e Hepatites Virais/Protocolo Clínico e Diretrizes Terapêuticas para Manejo da Infecção pelo HIV em Adultos. Brasília – DF, 2015.

Brasil. Ministério da Saúde.Epidemiologia e serviços de saúde. Rev Sistema Único Saúde. 2012;21(1):188.

Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do Mini exame do Estado Mental. Arq Neuro-Psiquiatr. 2003;61(3-B):777-81.

Cao B, Kong X, Kettering C, Yu P, Ragin A. Determinants of HIV-induced brain changes in three different periods of the early clinical course: A data mining analysis. Neuroimage Clin. 2015 Aug 1;9:75-82.

Capovilla AGS, Gutschow CRD, Capovilla FC. Habilidades cognitivas que predizem competência de leitura e escrita. Psicol Teor Prát. 2004;6(2):13-26.

Christo PP. Aspectos neuropsiquiátricos e neuropsicológicos da infecção pelo HIV e da AIDS. In: Fuentes D, Leandro F Malloy-Diniz LF, Pires Camargo CH, Moreira Cosenza R, organizadores. Neuropsicologia terórica e prática. Porto Alegre/RS: Artmed; 2008.

Christo, PP. Alterações cognitivas na infecção pelo HIV e AIDS. Revista. Ass Med Bras. 2010;56(2):242-47.

Comissaris CJ, Ponds RW, Jolles J. Subjective forgetfulness in a normal dutch populacion: possibilities for health education and other interventions. Patient Educ Couns. 1998;34(1):25-32.

Das MK, Sarma A, Chakraborty T. Nano-ART and NeuroAIDS. Drug Deliv Transl Res. 2016;6(5):452-72.

Deere JD, Chang WLW, Castillo LD, Schmidt KA, Kieu HT, Renzette N, et al. Utilizing a TLR5-Adjuvanted Cytomegalovirus as a Lentiviral Vaccine in the Nonhuman Primate Model for AIDS. PLoS One. 2016;11(5)e0155629.

Diniz BSO. Envelhecimento Cognitivo. In: Estimulação cognitiva para idosos – ênfase em memória. Rio de Janeiro: Atheneu; 2013.

Eastman JA, Hwang KS, Lazaris A, Chow N, Ramirez L, Babakchanian S, et al. Cortical Thickness and Semantic Fluency in Alzheimer's Disease and Mild Cognitive Impairment. Am J Alzheimers Dis. 2013;1(2):81-92.

Escott-Stump SE. Nutrição Relacionada ao Diagnóstico e Tratamento. São Paulo: Manole; 1999.

Ferreira LP, Befi-Lopes DM, Linongi SCO. Tratado de Fonoaudiologia. Rio de Janeiro: Roca; 2004.

Filho JRP, Santos FH. Brazilian Studies in HIV-Associated Dementia. DST J Bras Doenças Sex Transm. 2008;20(3-4):196-203.

Gindri G, Keske M, Mota HB. Memória de trabalho, conciência fonológica e hipótese de escrita. Pró-fono Rev Atual Cient. 2007;19(3):313-22.

Hayflick L. How and why age. Exp Gerontol. 1998;33(7-8):639-53.

Kalil RS, Bauer PG, Santoro GMR, Espíndola-Pereira IA, Ferry FRA, Motta RN, et al. Infecção HIV no Cérebro: as bases biológicas da neuropsicologia. DST J Bras Doenças Sex Transm. 2005;17(1):71-5.

Lawrence DM, Major EO. HIV-1 and the brain: connections between HIV-associated dementia, neuropathology and neuroimmunology. Microbes Infect. 2002,4:301-8.

Lemos DCH. Disartria. Rio de Janeiro: Enelivros; 1992.

Lima MD, Firmo AA, Martins-Melo FR. Trends in AIDS-related mortality among people aged 60 years and older in Brazil: a nationwide population-based study. AIDS Care. 2016;2:1-8.

Lourenço RA, Veras RP. Mini-Exame do Estado Mental: características psicométricas em idosos ambulatoriais. Rev Saúde Pública. 2006;40(4):712-9.

Mardh S, Nagga K, Samuelsson S. A longitudi¬nal study of semantic memory impairment in patients with Alzheimer's disease. Cortex. 2013;49(2):528-33.

MCDowd J, Hoffman L, Rozek E, Lyons KE, Pahwa R, Burns J, Kemper S. Understanding verbal fluency in healthy aging, Alzheimer's disease, and Parkinson's disease. Neuropsychology. 2011;25(2):210-25.

McRae M. HIV and viral protein effects on the blood brain barrier. Tissue Barriers. 2016;4(1):e1143543.

Morgado I. Psicología del aprendizaje y la memoria: fundamentos y avances recientes. Rev Neurol. 2005;40(5):289-197.

Neri AL. Envelhecimento cognitivo. In: Tratado de Geriatria e Gerontologia. Rio de Janeiro: Guanabara Koogan; 2006.

Nitrinir R, Lefèvre BH, Mathias SD, Caramelli P, Carrilho PEM, Sauaia N, et al.Testes neuropsicológicos de aplicação sim¬ples para o diagnóstico de demência. Arq Neuropsiquiatr. 1994;52(4):457-65.

Oliveira EM, Almeida EB, Silva TBL. Funções executivas no idoso: teoria, avaliação e estimulação. In: Estimulação cognitiva para idosos - ênfase em memória. Rio de Janeiro: Atheneu; 2013.

Oliveira GR, Cunha MC. Efeitos da atividade assistida por animais nas condutas comunicativas de idosos: abordagem fonoaudiológica. Distúrb Comun.2017;29(4):644-53.

Paul M, Sharp, Beatrice H. Origins of HIV and the AIDS Pandemic. Hahn Cold Spring Harb Perspect Med. 2011;1(1):a006841.

Rodrigues ABO, Yamashita ET. Teste de Fluência Verbal no Adulto e no Idoso: Verificação da aprendizagem verbal. Rev CEFAC. 2008;10(4):443-51.

Rosseli M, Tappen R, Williams C, Salvatierra J. The relation of education and gender on the attention items of the Mini Mental State Examination in Spainish speaking Hispanic elders. Arc Clin Neuropsychol. 2006;27(7):677-86.

Santana APO, Santos KP. Test de Fluidez Verbal: una revisión históricocrítica del concepto de fluência. Distúrb Comun. 2015;27(4):807-18.

Silva TBL, Neves GS, Almeida EB, Santos FS. Envelhecimento demográfico e cognitivo e a funcionalidade da população brasileira. In: Estimulação Cognitiva para idosos – ênfase em memória. Rio de Janeiro: Atheneu; 2013.

Soares R, Armindo RD, Rocha G. A imunodeficiência e o sistema imunitário. O comportamento em portadores de HIV. Arq Med. 2014;28(4):113-21.

Souza H, Marques D. Benefícios de Treinamento Aeróbio e/ou Resistido em Indivíduos HIV+: Uma Revisão Sistemática. Rev Bras Med Esporte. 2009;15(6):467-71.

Strauss EA. Compendium of neuropsychological tests: Administration, Norms, and Commentary. Oxford: Oxford University Press; 2006.

Yassuda MS. Memória e envelhecimento saudável. In: Tratado de Geriatria e Gerontologia. Rio de Janeiro: Guanabara Koogan; 2002.

****