Enfermería Global
ISSN 1695-6141
Revista electrónica cuatrimestral de Enfermería
Nº 75
Enero 2025
www.um.es/eglobal/

ORIGINALS

Semantic memory as a predictor of cognitive impairment in institutionalized older adults in Lima

La memoria semántica como predictor del deterioro cognitivo en adultos mayores institucionalizados de Lima

José Livia-Segovia[1]
Lina Grasso[2]
Agnes Daniel Herrera-Pino[3]
Mafalda Ortiz-Morán[1]
Nicolle Benavides-Munarriz[1]

[1] Universidad Nacional Federico Villarreal. Lima. Perú. jlivia@unfv.edu.pe
[2] Pontificia Universidad Católica Argentina. Buenos Aires. Argentina.
[3] Hospital Nacional Alcides Carrión. Región Callao. Perú.

https://doi.org/10.6018/eglobal.621891

elocation-id: e621891

Recibido: 12/07/2024
Aceptado: 03/11/2024

ABSTRACT:

Objective: To identify which components of semantic memory are predictors of cognitive impairment in older adults.
Material and Methods: Quantitative and predictive study, conducted on a non-probabilistic sample of 160 older adults in Metropolitan Lima, with an average age of 74.7 years, who were evaluated with the Mini-Mental Status Examination (MMSEA) on the Semantic Memory Evaluation Battery for Adults (EMSEA).
Results: 20.7% of the sample presented cognitive impairment. Regarding semantic memory, 23.4% obtained a low level, 49.4% an intermediate level and 27.2% a high level. According to the multivariate model, the factors associated to cognitive impairment were the semantic memory subtests: Picture Naming, Attributes Recognition and Verification of True or False Statements (R^2 = 30.8%, p≤.001). These results are reflected with a complementary network analysis, where the centrality analysis indicated that the Verbal Fluency task and Verification of True or False Statements, are the frameworks of greatest interest.
Conclusions: The existence of associated factors of semantic memory that better predict cognitive deterioration are Picture Naming, Attributes Recognition and Verification of True or False Statements.

Keywords: semantic memory, cognitive impairment, older adults.

RESUMEN:
Objetivo: Identificar que componentes de la memoria semántica son predictores del deterioro cognitivo en adultos mayores.
Material y Métodos: Estudio cuantitativo, predictivo, realizado sobre un muestreo no probabilístico en 160 adultos mayores de Lima Metropolitana, con un promedio de edad de 74.7 años, a los cuales se les evalúa con el Mini-Mental Status Examination y la Bateria de Evaluación de la memoria Semantica en Adultos (EMSEA).
Resultados: El 20,7% de la muestra presentaron deterioro cognitivo. Respecto a la memoria semántica obtuvo una categoría baja el 23,4%, un nivel promedio el 49,4% y un 27,2% nivel alto. De acuerdo con el modelo multivariado, los factores asociados con el deterioro cognoscitivo fueron los subtest de la memoria semântica: Denominación de dibujos, Reconocimiento de atributos y Verificación de la verdad-falsedad de enunciados (R^2 = 30,8%, p≤.001). Estos resultados quedan reflejados con un análisis complementario de redes, donde el análisis de centralidad indicó que la tarea de Fluidez verbal y Verificación de la verdad-falsedad de enunciados, son los nodos de mayor interés.
Conclusiones: La existencia de factores asociados de la memoria semántica que predicen mejor el deterioro cognitivo son: Denominación de dibujos, Reconocimiento de atributos y Verificación de la verdad-falsedad de enunciados.

Palabras claves: memoria semántica, deterioro cognitivo, adultos mayores.

INTRODUCTION

The National Institute of Statistics and Informatics [(1)] reported that in Peru in 2020 there were 4. 140.00 thousand adults over 60 years of age, making up 12.7% of the total population. In this context, it is expected that the prevalence of diseases associated with age, such as cognitive impairment, will increase, resulting in different diseases and/or injuries affecting the brain [(2)].

One aspect linked as a brain disease is mild cognitive impairment (MCI), considered as an intermediate mental state from a normal condition to dementia. In recent years, MCI has been recognized as a predementia state, becoming an important research topic in the prevention of dementia [(3)].

Sánchez-Rodríguez & Torrellas-Morales [7] refer to different forms of this disease: the amnestic single cognitive domain, amnestic multi-domain, non-amnestic single domain involvement and non-amnestic multi-domain MCI [(4)].

Climent, proposes a series of criteria for the diagnosis of MCI, focusing on concern about changes in cognition, alterations in cognitive functions-attention, memory, executive function, language and visuospatial skills, preservation on independence in functional or daily living skills, and the absence of indicators of dementia [(5)].

The identification of cognitive impairment at an early stage has become an increasingly important challenge for health professionals, estimating a prevalence around 15% and 20% in people aged 60 years and older [(6).] The annual rate at which MCI progresses to dementia is 12%. This rate is much higher than the other related to progression to dementia in the cognitively healthy population, or the one without prior diagnosis of MCI, which is 1 to 2% [7)]. A meta-analysis carried out in China notices that the prevalence of cognitive impairment is 15,4%, which varies according to lifestyle, demographics or morbidity [(8)]. In Latin America, a study was conducted in 9 countries whose prevalence of cognitive impairment varied from 6.8% to 25.5%, which differs according to age and education [(9)].

Cognitive impairment has been related to female gender, age and education level [10]. However, there are other factors such as chronic alcohol consumption, which produces serious damage on the cognitive area, accelerating the symptomatology and the irreversibility of brain damage [11].

Luna-Solis & Vargas[12] pointed out these other factors related to cognitive and functional impairment suspected of dementia: being 75 years of age or older (OR=7.80; p<0.001), being unemployed (OR=6.88; p=0.026), having less than 8 years of education (OR=2.97; p=0.003) and having had depressive episodes in the last 12 months (OR=5.58; p<0.001), on the other hand, self-care (OR=0.59; p<0.001) and occupational functioning (OR=0.73; p=0.001) were considered as protective factors against deterioration.

Educational level prevailed as the main indicator of cognitive impairment, against age and gender. In participants with incomplete primary education, a prevalence rate of 10.84% was recorded [13]. Moreover, Smith et al [14] indicate that there is a significant association between loneliness and MCI (OR = 1,52; IC95% = 1.12-2.07), suggesting reducing loneliness in low resource settings to prevent MCI and ultimately dementia.

Mild cognitive impairment (MCI) is characterized by a deficit in cognitive functions, but especially in memory, without any affection in the functional deterioration in the execution of the different tasks of daily activity or the presence of indicators of a dementia condition, since it is not gradual [15]. Not all people diagnosed with MCI develop dementia, but it is associated with a high probability of having it in the future compared to cognitively healthy people, hence its detection and monitoring is important to prevent or delay its onset.

Marti-Nicolovius & Arevalo-[16] Garcia state that in aging cognitive processes show a decline, especially attention, cognitive functions, cognitive flexibility, unlike short-term, procedural and semantic memory, which are maintained over time.

Gramunt[17] refers to the presence of five important aspects of memory: primary, episodic, semantic and procedural memory, as well as the perceptual representation system. Episodic and semantic memory is also a type of declarative and explicit memory, and non-declarative or implicit memory comprises procedural, primary and perceptual representation system.

Semantic memory is defined as the capacity to retain knowledge permanently, regardless of the specific event in which it is acquired [18]; it enables access to the meaning of concepts, the learning of new words and concepts, and all aspects associated with language.

On the other hand, in healthy older adults the semantic memory is relatively intact [16]. This is also affirmed by Lara-Useche et al. [19] in a study they conducted, where semantic memory enables differentiation between healthy people, those with mild cognitive impairment and others affected by Alzheimer's dementia, which is the most common type of dementia in older adulthood and characterized by a pattern of cortical impairment, mainly affecting episodic memory.

Considering that cognitive functions contribute to active and healthy aging, it is necessary to approach changes in cognition through screening tests that evaluate

alterations in global cognition and especially memory, the objectives of the study included determining whether semantic memory explains cognitive impairment in older adults in Lima, describing the prevalence of cognitive impairment in elderly people in institutions in Lima. Establishing a factor related to cognitive impairment making possible the implementation of evidence-based interventions, considering that it is part of the state policy to provide the elderly with comprehensive quality care.

METHODOLOGY

The study was quantitative, developing a multivariate associative strategy, since it focused on explaining cognitive impairment in terms of semantic memory components.

Participants

The sample consisted of 160 participants, 100 of them were institutionalized in nursing homes in Metropolitan Lima and 60 were users of a health center in the Northern Cone of Lima. The average age was 75.7 years, with a standard deviation of 9.4, including a minimum age of 60 and a maximum of 95. Males represented 49.7% (79) and females 50.3% (80), the level of education was distributed as follows: primary education 25.8%, secondary 50.3% and higher 23.9%. The sample was non-probabilistic, and cases with psychiatric diagnosis were excluded.

Instruments

Evaluation of semantic memory in Alzheimer's disease (EMSEA). The instrument aims to determine semantic impairments, based on seven areas: Attributes Recognition, Definition of Semantic Categories, Verbal fluency, Picture Naming, Word Matching, Verification of True or False Statements and Semantic Analogies. The psychometric properties obtained were reliability by internal consistency, with a Cronbach's Alpha coefficient of .75 and a Theta value of .80. The contribution to measure the construct of all the subtests registered acceptable values with coefficients between .33 and .69. With respect to criterion validity, the diagnostic sensitivity was found to be 80% and a specificity of 100%, with an area of the ROC curve of 91.7%. Internal validity confirmed the structure of the 7 factors comprising the instrument[2(20).]

The Mini-mental State Examination (MMSE) was designed by Folstein et al.[(21)] to screen the general cognitive state in a time of approximately 5 to 10 minutes. It consists of 30 items, including seven aspects: temporal and spatial orientation, attention, calculation, language, visual construction, immediate and fixation memory. The optimal cutoff was 23/24 points with adequate values for sensitivity of 94% and specificity of 91%. Robles[(22)] found an Alpha reliability coefficient of .82 for this screening assessment, a criterion validity with 86% of sensitivity and 94% of specificity, establishing that a score of 0 to 21 points indicates impairment[(23)].

Procedure

The instrument was applied individually and the protocol for administering the battery was followed. The researchers trained five evaluators who traveled to the health facilities. Two members of the research team reviewed and validated the response protocols. To collect the data, the respective authorization was requested from the

Head of each institution, respecting the Colegio de Psicologos del Peru and the Universidad Nacional Federico Villareal code of ethics, as well as the informed consent of the older adults who participated in the research was obtained.

The Statistical Package for the Social Sciences (SPSS-25) was used. The data analysis performed a multiple regression analysis to identify the explanatory model of cognitive impairment based on the subtests of the MMSEA, and the effect size and power were calculated with the GPower 3.1 program. For the analysis of the cognitive impairment network, the Fruchterman-Reingold algorithm and a partial correlation matrix were used. The measures of centrality used were strength, betweenness and closeness, which were calculated with the JASP 0.15 (https://jasp-stats.org/)

RESULTS

Characteristics of cognitive impairment and semantic memory in older adults

The assessment instrument used was the Mini-Mental State Examination (MMSE) considering the cut-off point of 21, representing a prevalence of cognitive impairment of 20.7%(IC95%=12.1%-27.8%). Regarding semantic memory, 23.4%, 49.4% and 27.2% were obtained for the low, intermediate and high category respectively.

Semantic memory and cognitive impairment

According to the model presented by the EMSEA, semantic memory is made up of seven tasks that evaluate different dimensions of semantic processing: Verbal fluency, Auditory Word-Picture Matching, Definition of Semantic Categories, Picture Naming, Attributes Recognition, Verification of True or False Statements and Semantic Analogies. On the other hand, cognitive impairment was assessed with the Mini-Mental State Examination (MMSE). The characteristics of the variables in terms of mean and standard deviation can be observed in Table 1, for each dependent and independent variable.

Table 1. Characteristics of the independent variables (EMSEA) and dependent variable (MMSE) of older adults.

Variables	Mean	Standard deviation
MMSE Total	24.49	4.83
EM.1 Fluency	47.72	20.07
EM.2 Category	47.02	19.15
EM.3 Naming	27.09	7.58
EM.4Atributes	71.94	19.21
EM.5 Matching	25.72	2.96
EM.6 Verification	40.81	9.07
EM.7 Analogies	10.37	7.14

The correlations between cognitive impairment and the dimensions of semantic memory are positive and significant, being the lowest with Auditory Word-Picture

Matching (r=.25, p=.001) and the highest with Verification of True or False Statements (r=.45, p=.001). Table 2.

Table 2. Correlation matrix of the semantic memory and cognitive impairment variables.

Variables	Cognitive Impairment	1	2	3	4	5	6
1.Verbal Fluency	.366**						
2.Definition of Semantic Categories	.379**	.714**					
3.Picture Naming	.452**	.526**	.422**				
4.Attributes Recognition	.378**	.460**	.520**	.252**			
5. Auditory Word-Picture Matching	.251**	.294**	.324**	.312**	.200*		
6.Verification of True or False Statements	.452**	.473**	.435**	.505**	.435**	.508**	
7.Semantic Analogies	.414**	.464**	.331**	.511**	.283**	.387**	.461**

The result of the multiple regression aimed to explain which components of semantic memory could predict cognitive impairment, with MMSE scores as the dependent variable and the EMSEA battery tasks as independent variables: Verbal fluency, Definition of Semantic Categories, Picture Naming, Attributes Recognition, Auditory Word-Picture Matching, Verification of True or False Statements and Semantic Analogies. The results in Table 3 show that the significance rates, effect size and statistical power are adequate and that the components of semantic memory predict an adjusted R^2 of 30.8% (F=22.96, p≤.001) for cognitive impairment.

Table 3. Stepwise multiple regression models for the cognitive impairment variable.

Models	F	R^2	ΔR^2	B	Standard error	β	p	1- β	f^2
Model 1	40.39	.205	.20	.45	.039	.452	.001	.99	.25
Verification	(1,157)								
Model 2	29.08 (2,156)	.272	.26				.001	1	.37
Verification				.16	.044	.301	.001		
Naming				.19	.050	.300	.002		
Model 3	22.96 (3,155)	.308	.29				.001	.99	.44
Verification				.11	.046	.214	.011		
Naming				.18	.049	.291	.001		
Attributes Recognition				.05	.019	.211	.005		

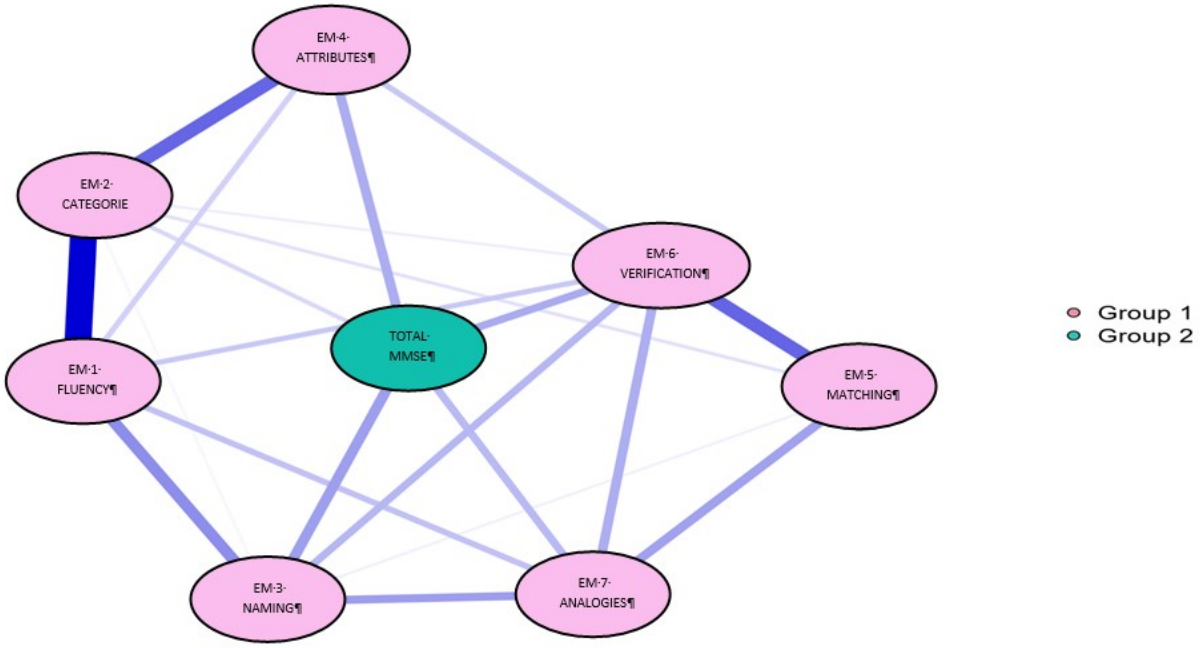
The results of the regression analysis show that when variables are incorporated into the model, it shows greater explanatory power for cognitive impairment, as well as a higher level of statistical power and effect size. These indexes exceed the large ones of .80 and .35 making it possible to affirm that the results are clinically relevant for the prediction of cognitive impairment.

In addition, the VIF (Variance inflation factor) multicollinearity indicators were below 10 and the tolerance values were greater than .20, indicating that there are no high correlations among the factors of the model. Likewise, the Durbin Watson indicator

was found to be within two units, having the possibility of affirming a generalization of the data.

On the other hand, a network analysis was performed showing in Image 1 a visualization of the network of seven subtests and cognitive impairment, all with positive association, being cognitive impairment (total MMSE) at the center of the network, with four aspects being most strongly linked: Attributes Recognition, Picture Naming, Verification of True or False Statements and Semantic Analogies, being weaker with Definition of Categories with no link with Semantic fluency and Auditory Word-Picture Matching. The connectivity between the nodes allows us to observe a strong correlation between Definition of Semantic Categories and Fluency (r=.71), followed of Semantic Categories and Attributes Recognition (r=.52), as well as Verification of True or False Statements and Auditory Word-Picture Matching (r=.50).

Image 1. Estimated network of cognitive impairment and semantic memory variables.



The first centrality measure is called Intermediacy which is the number of shortest paths passing through the node of interest; so Verbal Fluency Intermediacy is greater than all subtests, followed by Verification of True or False Statement, which means that there are more shortest paths passing through these subtests. The second centrality measure is called Closeness: the inverse of the sum of all shortest paths from the node of interest to all other nodes is Picture Naming. In general, a higher centrality measure indicates that this node is more central to the network. Overall, analyzing all centrality indexes, higher values indicate more of this in the case of Verbal Fluency and Verification of True or False Statements, which had relatively numerous and strong connections (Table 4).

Table 4. Centrality indexes of semantic memory and cognitive impairment variables from network analysis.

Variables	Intermediation	Proximity	Strength	Expected influence
EM1. Fluency	1.539	0.729	1.251	1.251
EM2. Categories	0.062	-0.327	0.922	0.922
EM3. Naming	-0.431	1.331	-0.215	-0.215
EM4. Attributes	-0.431	-0.758	-0.930	-0.930
EM5. Matching	-0.923	-1.867	-1.447	-1.447
EM6. Verification	1.539	0.580	1.125	1.125
EM7. Analogies	-0.923	-0.114	-0.176	-0.176
MMSE	-0.431	0.426	-0.531	-0.531

DISCUSSION

The aim of this study was to establish whether semantic memory intervenes as a predictive factor of cognitive impairment in older adults, considering that this independent variable is affected in Alzheimer's disease [24] since the processing of semantic categories is a sensitive measure for the diagnosis of this disease or other dementias [25]. For this purpose, the Semantic Memory Assessment Battery for Older Adults (EMSEA), a scale with evidence of psychometric properties, was selected.

Regarding the objectives, 20% of older adults with cognitive impairment were identified. In this regard, Belón-Hercilla & Soto-Añari [26] reported a prevalence of 13.1% in older adults while Soto-Añari and Belón-Hercilla[27] obtained 21%. Also, Luna-Solis & Vargas Murga[28] in Metropolitan Lima reported that 17% of their study sample presented cognitive impairment, to whom the *Mini-Mental State Examination* was applied, compared to 14.7% identified with the Pfeffer Questionnaire.

On the other side, in Spain, 27% prevalence of MCI was reported among institutionalized adults [29]. In addition, a meta-analysis noted the prevalence of cognitive impairment among Chinese elderly 15,4 % (IC del 95 %: 13,5-17,4 %) [11]. A systematic review to assess the prevalence of MCI in Latin American and Caribbean countries estimated data ranging from 6,8% and 25,5 % [30]. Therefore, the prevalences reported are different depending on the countries and the instrument used, and it should be noted that the confidence interval reported in this study covers what is reported by empirical and theoretical research.

To evaluate the objective of the study, a multiple regression analysis was performed, understanding that semantic memory comprises: Verbal fluency, Auditory Word-Picture Matching, Definition of Semantic Categories, Verification of True or False Statements, Semantic Analogies, Picture Naming and Attributes Recognition. The model explained 30.8% of cognitive impairment, with the last three dimensions mentioned as predictive variables.

Grasso, Díaz-Mardomingo and Peraita-Adrados [31], indicated that semantic memory is a long-term store system, organizing knowledge about words and other mental symbols, considering their meaning and referents, having its neuroanatomical location

in the temporal-medial regions and mediated by the temporal-parietal regions, with special relevance of the left temporal cortex.

On their behalf, Clemente, García-Sevilla & Méndez[32] state that at this stage of life, cognitive changes associated with aging develop, such as: the decline in cognitive processing, the presence of attentional alterations, the decrease in executive capacities, evidence of difficulties in some language components, pronounced difficulty in lexical access or problems of denominative type, as well as a decrease in the areas of visual, verbal and working memory, resulting in one of most affected neuropsychological processes bases, making it difficult to retain telephone numbers, names, location of objects, among others. Galeote & Peraita [33] argue that the main differentiation between older adults and patients with Alzheimer's disease is that the latter mentioned show impairments in the elaboration of semantic categories.

Also, Cuetos, Rodríguez- Ferreiro & Martínez [34] made a comparison between the different forms of memory among healthy older adults and those with early-stage Alzheimer's disease, with equivalent characteristics in terms of sex, cultural level and age, having as results that the most affected form of memory is the public memory and the capacity for new learning, despite the statistical differences in autobiographical and semantic memory. Furthermore, other studies show that patients in early stages of Alzheimer's disease and with Mild Cognitive Impairment tend to make more frequent errors in the content and processing of specific semantic categories compared to older adults [35].

Conceptual skills have different components; therefore, they can be assessed using different skills or competencies:

Picture Naming is a component of expressive language that assesses the ability of individuals to access and retrieve semantic information [36]. The exploration of naming can be performed using stimuli of high (common or everyday use) or low (known, but not in everyday use) frequency and grouped into different categories. It is evaluated if the person can evoke (name) the stimulus spontaneously or require phonological help to do it, also considering the errors that may occur.

Attributes Recognition is a complementary sub-test of category definition, where the attributes of a stimulus are expressed spontaneously; in other words, it manifests the knowledge of certain characteristics (attributes) that the individual owns about the exposed stimuli, which in this case the evaluator induces to make it explicit.

Verification of True or False Statements is a complementary test of Category Naming and Attributes Recognition. According to Peraita [37] it is a test of semantic judgments about categories; it means that it evaluates the ability of people to assess the True or False Statements of Semantic Categories presented in the form of statements.

Joubert et al. [38] analyzed 22 studies noting that MCI patients perform significantly worse than matched healthy controls in terms of overall semantic performance (mean effect size of 1,02; IC del 95 % [0,80; 1,24]), concluding that semantic deficits are a key feature of MCI.

As mentioned, the EMSEA presents adequate psychometric properties in the evaluation of semantic memory, it was also identified that the tasks of Picture Naming,

Verification of Statements and Semantic Analogies are predictors of cognitive impairment, but it is convenient to evaluate it with clinical samples.

The structure of the relationships between semantic memory test scores and cognitive impairment was investigated with network analysis using graph theory. Network analysis verified that cognitive impairment is most strongly associated with Verification, Naming and Attributes Recognition, where the central semantic memory component was Verification.

Previous studies indicate that older adults may present a decrease in episodic memory and working memory functions [32]. Semantic memory processing remains stable, in other words, it is not expected to show deterioration. Therefore, when a clinical evaluation is carried out and there is evidence of a decline in a semantic memory test, it is considered a sign that can be associated with cognitive impairment.

In the common neuropsychological evaluation, different tests are used to determine the presence of semantic alterations. The semantic fluency and picture naming tasks are the most used in the clinic [39,40]. However, the assessment of the integrity of semantic information presents some difficulties if some factors, such as item familiarity, item type and semantic category, are not controlled. Therefore, to make a good diagnosis, it is necessary to obtain concurrence in the tests that evaluate semantic impairment, for example, observing an altered performance in certain types of items (e.g. those referring to Inanimate Objects) regardless of the presentation modality (visual or auditory) or that the type of process (comprehension or production) considered [41]. Hence the need to analyze the performance of the patient by means of semantic assessment batteries that provide a set of different tests or tasks designed as a set.

One of the advantages of the EMSEA Battery is that it evaluates the conceptual knowledge of semantic categories with different tests. These constitute a coherent and structured set of semantic memory exploration characterized by: the balanced selection of items in each of the tests (50% belonging to categories of Living Beings and the other 50% to categories of Inanimate Objects); the control of their frequency and the introduction of two levels of difficulty depending on this frequency; the existence of two *input* modalities (verbal and visual stimulus) and the proportional evaluation of comprehension and knowledge production processes [36].

In our search with institutionalized older adults living in Metropolitan Lima, semantic changes that predict cognitive impairment were observed in the tasks of Picture Naming, Semantic Attributes Recognition and Verification of True or False Statements. These alterations reflect a loss of integrity of some components of semantic memory, which are predictors of cognitive impairment.

First, poor performance on the Picture Naming subtest is evidence of a difficulty in language expression when presented with visual stimuli. This decline may be caused by a problem in accessing or recovering information from semantic memory, as well as in the underlying visuo-perceptual and phonological processes [42]. Second, the drawbacks in verbally expressing semantic attribute knowledge are corroborated by decreased performance on the Attributes Recognition subtest, since the deficit is presented even when the evaluator facilitates retrieval by inducing responses. Likewise, problems in adequately solving the Verification of True or False Statements

subtest show difficulties in establishing judgments about semantic relationships between categories. It is important to highlight that this last subtest is complementary to Attributes Recognition, whereby the knowledge of the components or conceptual relations of the categories that may or may not have been recognized on it is evaluated and verified.

It can be concluded that the existence of associated factors of semantic memory that better predict cognitive impairment are Picture Naming, Attributes Recognition and Verification of True or False Statements.

Among the limitations of the study, it can be mentioned that the MMSE technique is widely used in the clinic as a screening instrument to assess cognitive impairment, but it is not able to classify the subtypes of MCI. Therefore, future research should consider this aspect to assess possible differences in impairment, according to the affection of cognitive domains. Similarly, the population evaluated corresponds mostly to institutionalized older adults and should be compared with those of the general population. Finally, comparisons should be made between populations with different educational and socio-economic levels, to verify the presence of impairments independently of these socio-demographic contexts.

ACKNOWLEDGEMENT

The authors would like to thank the Vice-Chancellor's Office of Research of the Universidad Nacional Federico Villareal for funding the study, which was approved by R.R. 589-2017-UNFV.

REFERENCES

1. Instituto Nacional de Estadística e Informática, INEI. En El Perú Existen Más De Cuatro Millones De Adultos Mayores [Internet]. Nota de Prensa del INEI: Oficina Técnica de Difusión; 2020 [Revisado 19 de Mayo 2022]. Disponible en: https://m.inei.gob.pe/media/MenuRecursivo/noticias/np121_2020.pdf
2. Organización Mundial de la Salud, WHO. Dementia [Internet]. Sala de Prensa WHO: WHO; 2020 [Revisado 19 de Mayo 2022]. Disponible en: https://www.who.int/news-room/fact-sheets/detail/dementia
3. Isordia-Martínez, J., Gongora-Rivera, F., Leal-Bailey, H, Ortiz-Jiménez, X. Mild cognitive impairment. Medicina Universitaria [Internet]. 2014 [Consultado 19 de Mayo 2022]; 16 (62): 28 - 26. Disponible en: https://www.elsevier.es/en-revista-medicina-universitaria-304-articulo-mild-cognitive-impairment-X1665579614283699
4. Sanchez-Rodriguez, J., Torellas-Morales, C. Revisión del constructo deterioro cognitivo leve: aspectos generales. Rev Neurol [Internet]. 2011 [Consultado 20 de mayo 2022]; 52 (1): 300-305. Disponible en: https://www.neurologia.com/articulo/2010245
5. Climent, M., Botella, P., Moreno, L. Factores de Riesgo asociados al deterioro cognitivo. Prevención desde la Oficina de Farmacia [Tesis doctoral]. Moncada: Universidad CEU Cardenal Herrera. Moncada; 2014. Disponible en: https://repositorioinstitucional.ceu.es/handle/10637/7040
6. Petersen, RC. Mild Cognitive Impairment. Continuum (Minneap Minn) [Internet] 2016 [Consultado 20 de mayo 2022]; 2(1): 404-418. Disponible en:

https://pubmed.ncbi.nlm.nih.gov/27042901/. Doi: https://doi.org/10.1212/con.0000000000000313
7. González-Martínez, P., Oltra-Cucarella, J., Sitges-Maciá, E., & Bonete-López, B. Revisión y actualización de los criterios de deterioro cognitivo objetivo y su implicación en el deterioro cognitivo leve y la demencia. Rev Neurol [Internet]. 2021 [Consultado 20 de mayo 2022]; 72(1): 288-295. Disponible en: https://www.neurologia.com/articulo/2020626. Doi: http://dx.doi.org/10.33588/rn.7208.2020626
8. Deng, Y., Zhao, S., Cheng, G., Yang, J., Li, B., Xu, K. et al. The Prevalence of Mild Cognitive Impairment among Chinese People: A Meta-Analysis, Neuroepidemiology [Internet]. 2021 [Consultado 20 de mayo 2022]; 55 (2): 79-91. Disponible en: https://pubmed.ncbi.nlm.nih.gov/33756479/. Doi: https://doi.org/10.1159/000512597
9. Silva, F., Teixeira-Santos, A., Leist, A. The prevalence of mild cognitive impairment in Latin America and the Caribbean: a systematic review and meta-analysis. Aging Ment Health [Internet]. 2021 [Consultado 20 de mayo 2022]; 29(1): 1-11. Disponible en: https://pubmed.ncbi.nlm.nih.gov/34844480/. Doi: https://doi.org/10.1080/13607863.2021.2003297
10. Mías, CD., Sassi, M., Masih, ME., Querejeta, A., Krawchik, R. Deterioro cognitivo leve: estudio de prevalencia y factores sociodemográficos en la ciudad de Córdova, Argentina. Rev Neurol [Internet]. 2007 [Consultado 20 de mayo 2022]; 44 (12): 733-738. Disponible en: https://www.neurologia.com/articulo/2006206. Doi: https://doi.org/10.33588/rn.4412.2006206
11. Mersy, DJ. Recognition of alcohol and substance abuse. Am Fam Physician. [Internet] 2003 [Consultado 20 de mayo 2022]; 67:1529-1532. Disponible en: https://www.aafp.org/afp/2003/0401/p1529.html
12. Luna-Solis, Y., Vargas Murga, H. Factores asociados con el deterioro cognoscitivo y funcional sospechoso de demencia en el adulto mayor en Lima Metropolitana y Callao. Revista de Neuro-Psiquiatria [Internet]. 2018 [Consultado 20 de mayo 2022]; 81(1):9. Disponible en: https://revistas.upch.edu.pe/index.php/RNP/article/view/3269. Doi: https://doi.org/10.20453/rnp.v81i1.3269
13. Cervigni, M., Martino, P., Alfonso, G., Gallegos, M. Cribado de deterioro cognitivo leve en Rosario (Argentina). Resultados por edad, género y nivel educativo. Neurología Argentina [Internet]. 2021 [Consultado 20 de mayo 2022]; 13 (2): 95-102. Disponible en:https://www.researchgate.net/publication/352353102_Cribado_de_deterioro_cognitivo_leve_en_Rosario_Argentina_Resultados_por_edad_genero_y_nivel_educativo. Doi: 10.1016/j.neuarg.2021.04.005
14. Smith, L., Bloska, J., Jacob, L., Barnett, Y., Butler, L., Trott, M., Odell-Miller, H., Veronese, N., Kostev, K., Bettac, EL., Godier-McBard, L., Koyanagi, A. Is loneliness associated with mild cognitive impairment in low- and middle-income countries?. Int J Geriatr Psychiatry [Internet]. 2021 [Consultado 20 de mayo 2022]; 36(9):1345-1353. Disponible en: https://onlinelibrary.wiley.com/doi/abs/10.1002/gps.5524. Doi: http://dx.doi.org/10.1002/gps.5524
15. Tangalos, E., Petersen, R. Mild Cognitive Impairment in Geriatrics. Clin Geriatr Med [Internet]. 2018 [Consultado 20 de mayo 2022]; 34 (4): 563-589. Disponible en: https://pubmed.ncbi.nlm.nih.gov/30336988/. Doi: https://doi.org/10.1016/j.cger.2018.06.005

16. Marti-Nicolovius, M. & Arévalo-García, R. Envejecimiento y memoria: efectos de la restricción calórica. Rev Neurol [Internet]. 2018 [Consultado 20 de mayo 2022]. 66: 415-422. Disponible en: https://www.neurologia.com/articulo/2017516
17. Gramunt, N. Normalización y validación de un test de memoria en envejecimiento normal, deterioro cognitive leve y enfermedad de Alzheimer [Tesis doctoral]. Barcelona: Universitat Ramon Llull; 2008. Disponible en: https://www.tdx.cat/handle/10803/9261;jsessionid=028AA88BA1BD68D65970CCBE7469FC56#page=1
18. Carrillo-Mora, P. Sistemas de memoria: reseña histórica, clasificación y conceptos actuales. Segunda parte: Sistemas de memoria de largo plazo: Memoria episódica, sistemas de memoria no declarativa y memoria de trabajo. Salud Ment [Internet]. 2010 [Consultado 20 de mayo 2022]; 33(2): 197-205. Disponible en: http://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S0185-33252010000200010&lng=es.
19. Lara-Useche, E.; Pineda, D.A., Henao-Arboleda, E., Arboleda-Ramírez, A., Aguirre-Acevedo, D.C., Lopera, F. Descripción del desempeño en memoria semántica en una muestra de la población antioqueña. Rev Neurol [Internet]. 2006 [Consultado 20 Mayo 2022]; 42: 272-276. Disponible en: https://www.neurologia.com/articulo/2004639. Doi: https://doi.org/10.33588/rn.4205.2004639
20. Livia-Segovia, J., Grasso, L., Herrera-Pino, A., Ortiz-Morán, M., Benavides-Munarriz, N. Estandarización de la batería de Evaluación de la Memoria Semántica (EMSEA) en adultos mayores institucionalizados de Lima. Enfermería Global [Internet]. 2023 [Consultado 12 de noviembre 2024]; 70: 162-176. Disponible en: https://revistas.um.es/eglobal/article/view/529951. Doi: https://doi.org/10.6018/eglobal.529951
21. Folstein, M., Folstein, S., McHugh, P. “Mini-mental state”. A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res [Internet]. 1975 [Consultado 20 de Mayo 2022]; 12 (3): 189-198. Disponible en: https://www.sciencedirect.com/science/article/abs/pii/0022395675900266?via%3Dihub. Doi: https://doi.org/10.1016/0022-3956(75)90026-6
22. Robles, Y. Adaptación del Mini-Mental State Examination [Tesis Doctoral]. Lima: Universidad Nacional Mayor de San Marcos; 2003. Disponible en: https://cybertesis.unmsm.edu.pe/bitstream/handle/20.500.12672/3303/robles_ay.pdf?sequence=1&isAllowed=y
23. Escribano-Aparicio, M., Pérez-Dively, M., García-García, F., Pérez-Martín, A. Romero, L., Ferrer, G. Validación del MMSE de Folstein en una población española de bajo nivel educativo. REGG [Internet]. 1999. [Consultado 20 de mayo 2022]. Disponible en: https://www.elsevier.es/es-revista-revista-espanola-geriatria-gerontologia-124-articulo-validacion-del-mmse-folstein-una-13011685
24. Deus-Yela, J., Devi-Bastida, J., Sains-Pelayo, M. Neuropsicología de la enfermedad de Alzheimer. Editorial Síntesis [Internet]. 2018 [Consultado 20 de mayo 2022]. Disponible en: https://www.sintesis.com/data/indices/9788491711322.pdf
25. Grasso, L. & Peraita, H. Adaptación de la batería de Evaluación de la Memoria Semántica en la Demencia de Tipo Alzheimer (Emsda) a la población de la ciudad de Buenos Aires. Interdisciplinaria [Internet]. 2011 [Consultado 20 de mayo 2022]; 28 (1): 37-56. Disponible en: https://www.redalyc.org/articulo.oa?id=18022327003
26. Belón, V. & Soto, M. Perfil cognitivo del adulto mayor en Arequipa. Revpsi [Internet]. 2015 [Consultado 20 de mayo 2022]; 17 (2): 91-103. Disponible en:

https://revistas.ucv.edu.pe/index.php/revpsi/article/view/390 . Doi: https://doi.org/10.18050/revpsi.v17n2a5.2015
27. Soto-Añari, M. & Belón-Hercilla, M. Indicadores de sensibilidad y especificidad para dos puntos de corte del Mini Mental State Examination: Estudio preliminar. Rev Neuropsiquiatr [Internet]. 2017 [Consultado 20 de mayo 2022]; 80(2): 88-93. Disponible en: http://www.scielo.org.pe/scielo.php?script=sci_arttext&pid=S0034-85972017000200002&lng=es
28. Luna-Solis, Y. & Vargas-Murga, H. Factores asociados con el deterioro cognoscitivo y funcional sospechoso de demencia en el adulto mayor en Lima Metropolitana y Callao. Revista de Neuropsiquiatria. [Internet]. 2018 [Consultado 20 de mayo 2022]; 81(1): 9-19. Disponible en: http://www.scielo.org.pe/scielo.php?pid=S0034-85972018000100003&script=sci_abstract&tlng=pt. Doi: https://doi.org/10.20453/rnp.v81i1.3269.
29. Vallejo, J. & Rodríguez, M. Prevalencia del deterioro cognitivo leve en mayores institucionalizados. Gerokomos [Internet]. 2010 [Consultado 20 de mayo 2022]; 21(4): 153-157. Disponible en: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1134-928X2010000400003&lng=es
30. Ribeiro, F., Teixeira-Santos, A., Leist, A. The prevalence of mild cognitive impairment in Latin America and the Caribbean: a systematic review and meta-analysis. Aging Ment Health [Internet]. 2021 [Consultado 20 de mayo 2022]; 29: 1-11. Disponible en: https://pubmed.ncbi.nlm.nih.gov/34844480/. Doi: https://doi.org/10.1080/13607863.2021.2003297
31. Grasso, L., Díaz-Mardomingo, C., Peraita-Adrados, H. Deterioro de la memoria semántico-conceptual en pacientes con enfermedad de Alzheimer. Análisis cualitativo y cuantitativo de los rasgos semánticos producidos en una tarea verbal de definición categorial. Psicogeriatría [Internet]. 2011 [Consultado 30 de mayo 2022]; 3 (4): 159-165. Disponible en: https://www.viguera.com/sepg/pdf/revista/0304/304_0159_0165.pdf
32. Clemente, Y., García-Sevilla, J., Méndez, I. Memoria, funciones ejecutivas y deterioro cognitivo en población anciana. European investiga [Internet]. 2015 [Consultado 20 de mayo 2022]; 5 (2): 153-163. Disponible en: https://www.researchgate.net/publication/283721457_Memoria_funciones_ejecutivas_y_deterioro_cognitivo_en_poblacion_anciana . Doi: http://dx.doi.org/10.1989/ejihpe.v5i2.108
33. Galeote, M. & Peraita, H. Memoria Semántica y fluidez verbal en demencias. Revista Española de Neuropsicología [Internet]. 1999 [Consultado 20 de mayo 2022]; 1 (2): 3-17. Disponible en: https://sid-inico.usal.es/idocs/F8/ART11241/memoria_semántica.pdf
34. Cuetos, F., Rodríguez-Ferreiro, J., Martínez, C. Alteraciones de memoria en los inicios de la enfermedad de Alzheimer. Revista Española de Neuropsicología [Internet]. 2003 [Consultado 20 de mayo 2022]; 5(1), 15-31. Disponible en: https://dialnet.unirioja.es/servlet/articulo?codigo=1126510
35. Grossman, M., Peelle, J, Smith E, McMillan C, Cook P, Powers J, et al. Category-specific semantic memory: Converging evidence from bold fMRI and Alzheimer's disease. NeuroImage [Internet]. 2013 [Consultado 20 de mayo 2022]; 68(1): 263-274. Disponible en: http://jpeelle.net/reprints/Grossman-2013-Category-specific_semantic_memory_converging_evidence_from_BOLD_fMRI_and_Alzheimers_disease.pdf . Doi: https://doi.org/10.1016/j.neuroimage.2012.11.057
36. Grasso, L., & Peraita, H. Adaptación de la batería de evaluación de la memoria semántica en la demencia tipo Alzheimer (EMSDA) a la población de la ciudad de

Buenos Aires. Interdisciplinaria [Internet] 2011 [Consultado 20 de mayo 2022]; 28 (1): 37-56. Disponible en: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.redalyc.org/pdf/180/18022327003.pdf
37. Peraita, H. Batería de evaluación de la memoria semántica en demencia tipo Alzheimer (EMSDA; Peralta, González-Labra, Sánchez Bernardos y Galeote, 2000 y 2001): algunos aspectos aclaratorios y complementarios. RPPC [Internet]. 2006 [Consultado 20 de mayo 2022]; 11(2): 115-22. Disponible en: https://revistas.uned.es/index.php/RPPC/article/view/4023
38. Joubert, S., Gardy, L., Didic, M., Rouleau, I., Berbeau, E.A. Meta-Analysis of Semantic Memory in Mild Cognitive Impairment. Neuropsychology Review [Internet]. 2020 [Consultado 20 de mayo 2022]; 31: 221-232. Disponible en: https://link.springer.com/article/10.1007/s11065-020-09453-5 . Doi: https://doi.org/10.1007/s11065-020-09453-5
39. Martinez-Cuitiño, M., & Jaichenco, V. Evaluación de la memoria semántica. Revista de Psicología [Internet]. 2012 [Consultado 20 de mayo 2022]; 8 (16). Disponible en: https://repositorio.uca.edu.ar/bitstream/123456789/5968/1/evaluacion-memoria-semantica-cuitino-jaichenco.pdf
40. De la Hoz, M., Garrido, D. y García-Retamero, R. Alteraciones lingüísticas en pacientes con deterioro cognitivo leve. Revisión sistemática. Rev Neurol [Internet]. 2021 [Consultado 20 de mayo 2022]; 72 (03): 67-76. Disponible en: https://neurologia.com/articulo/2020411. Doi: https://doi.org/10.33588/rn.7203.2020411
41. Moreno, F. & Peraita, H. Análisis de la estructura conceptual de categorías semánticas naturales y artificiales en una muestra de pacientes de Alzheimer. Rev. Psicothema. [Internet]. 2006 [Consultado 20 de mayo 2022]; 18 (3): 492-500. Disponible en: https://www.psicothema.com/pdf/3243.pdf
42. Martin, A. & Fedio, P. Word production and comprehension in Alzheimer's disease: The breakdown of semantic knowledge. Brain and Language [Internet]. 1983 [Consultado 20 de mayo 2022]; 19 (1): 124-41. Disponible en: https://psycnet.apa.org/record/1983-25991-001. Doi: https://doi.org/10.1016/0093-934X(83)90059-7

ISSN 1695-6141