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THE ASSOCIATION OF THE MMSE AND OPERATIONAL MEMORY INDEX (WAIS III) IN ELDERLY PERSONS PARTICIPATING IN INFORMATION TECHNOLOGY WORKSHOPS IN THE MUNICIPALITY OF NOVO HAMBURGO – BRAZIL

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ABSTRACT

Population aging is a worldwide phenomenon and has been increasing exponentially, this increase is due to several factors, but the main ones are the increase in life expectancy and the decrease in the birth rate. The main objective of this work is to analyze the association between the results of the Mini Mental State Examination (MMSE) and the Operational Memory Index (WAIS-III). The methodological design of the study is quantitative, descriptive and transversal. The sample of this study is non-probabilistic for convenience. We analyzed 22 elderly people, over 60, of both sexes, who regularly attend the computer activities of the Digital Inclusion Board of the Municipality of Novo Hamburgo-Brazil. The analysis was performed using the Spearman correlation test with significance level ≤0.05. The results showed that there is a significant correlation (rho = 0.713/p = 0.000) between the MMSE and its subdivisions (Guidance, Immediate Memory, Attention and Calculus, Evocation and Language) with the Operational Memory Index, (Digits, Arithmetic and Sequence of Numbers and Letters). We can conclude from the data of this sample that the MMS Ecan be used to evaluate the operational memory with precision, mainly in context where a faster application is required.

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INTRODUCTION

Population aging is a worldwide phenomenon and has been increasing exponentially, this increase is due to several factors, but the main ones are the increase in life expectancy and the decrease in the birth rate. The increase in the elderly population qualifies the importance of research studies and intervention strategies to understand aging in its various perspectives (IBGE, 2016). As a result of this, there was a change in the demographic and epidemiological profile of the population, which consequently increased the number of people who reach beyond old age and reach old age healthy and with potential for several years of life. Paul Baltes (1997), a leading scholar in the field of aging, developed Lifespan lifecycle methodology, where aging is considered a continuous and heterogeneous process, which means that it corresponds to different patterns according to the individual and its historical context. It consists of several changes, both normative and non-normative, which are determined by genetic, biological, social, and cultural issues and are therefore associated with the losses and gains arising from the interaction between the individual and the culture and the environment in which it is inserted. According to Argimon and Stein (2005), in Brazil and in the world, as awareness for population aging increases, so does the concern about reaching a successful old age. Along with this several factors are involved to contribute in the quest for quality of life with longevity, keeping the active life, the body healthy and the mind lucid. According to Yassuda (2002), among the various difficulties encountered by these elderly people on the path of successful aging is memory, being the most common complaint among them. In the last decades, in the field of gerontology, it is one of the most researched subjects. Since within the process of successful aging changes are expected in the cognitive functions of the human being, and among them is the memory. Yet, according to the author, the effects of aging memory and its subsystems

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do not occur uniformly, as there is also a great variability in the intensity of these effects among people. According to Yassuda (2002), memory is the fundamental cognitive function of the human being. It is through this that we acquire and store information and knowledge. It is a basic premise for the development of language, for recognizing people and objects, for identifying us, for recognizing us and for the continuity of our lives. Without memory, the human being would always be restarting life without the possibility of resorting to what he/she had previously learned. According to Yassuda and Abreu (2006), the performance of cognitive functions is entirely related to the subjective dimensions that comprise the definition of quality of life for the elderly. Cognitive capacity is one of the determinants of quality of life in old age, since losses in cognitive functions may result in impairment in the physical, social and emotional functioning of the elderly (Ribeiro and Yassuda, 2007). According to Moraes, Moraesand Lima (2010), aging represents the set of consequences or the effects of the passage of time. All major physiological systems are biologically affected and can be considered as morph functional involution. However, this involution does not prevent the person from remaining active, independent and happy. The memory is divided into several types of memory, and the main memory systems recognized by cognitive psychology are sensory memory, operational memory (also known as working memory), and long-term memory that is still divided into declarative memory (subdivided into episodic memory and semantic memory) and memory of procedures. Several studies in the field of memory show that not all subsystems of memory are uniformly reached during the aging process, some are more affected than others, such as operational memory, which will be the object of this study (Sé *et al.,* 2004). According to Machado (2004), the cerebral cortex is the thin layer of gray matter that lines the medullary white center of the brain. It is one of the most important parts of the nervous system.

In the cortex come impulses coming from all the sensibility pathways that become conscious and interpreted. From the cortex come the nervous impulses that initiate and command the voluntary movements and with it are related the psychic phenomena. It is the cortex, however that opens the world of information stored for use by the mind. The neurons, forming units of the Central Nervous System (CNS), have structure stability, an attribute that is a prerequisite for cognition. This property makes the CNS apt to accumulate information from the present, to remember the past and to formulate new concepts. The cortical regions are not uniformly affected in this cellular loss, since neurons of the same region have unique molecular phenotypes and, therefore, different fragilities to the harmful processes, being the prefrontal cortex more sensitive to the changes of the aging (Gazzaniga *et al.,* 2006). In this article, we work with the Operational Memory that is the capacity to store information for a short and limited time, while it uses it to solve some problem, updating necessary information. It allows the mental manipulation of information, making it possible to relate ideas, integrate information, remember sequence or order of events (Baddeley, Anderson& Eysenck, 2011). This is why, in view of the accelerated growth of the elderly population, it is important to study and research in this area, being that we are living an important period of longevity. The main objective of this study is to investigate whether there is aassociation between the results of the Mini Mental State Examination (MMSE) and the Operational Memory Index.

MATERIALS AND METHODS

The methodology used is of quantitative, descriptive and transversal design. The sample of this study is non-probabilistic for convenience and comprises 22 elderly people, over 60 years old, of both sexes, who regularly attend the informatics activities of the Board of Digital Inclusion of the Municipality of Novo Hamburgo, Brazil. The inclusion criteria were: to be over 60 years of age, not institutionalized or hospitalized; possess mental and health conditions to have independence and autonomy to participate in the study. Exclusion criteria were dementia, fragility syndrome, hospitalization or institutionalization. The instruments used to perform this work were: Mini Mental State Examination (MMSE), which is a cognitive screening test that evaluates several cognitive domains: temporal and spatial orientation, immediate memory and recall, attention/calculation, language/naming, repetition, understanding, writing and copying of drawings. The scores ranged from 0 (did not perform any activity correctly) to 30 (performed all activities correctly) being a short assessment instrument of cognitive deficit widely used in the evaluation of the elderly and was developed by Folstein, Folstein and McHugh (1975) and translated by Bertolucci *et al.* (1994). The Wechsler Adult Intelligence Scale - WAIS III (Wechsler, 2004) is an instrument used for individual clinical assessment of the intellectual capacity of adults aged 16-89 years. It contains a total of 14 subtests, for this study were selected, the subtests that measure the Operational Memory Index - Arithmetic, Digits, Sequence of Numbers and Letters. According to Wechsler (2004), the Operational Memory Index is a measure of complex tasks or requiring a high level of attention, focusing on the ability to pay attention to information, to retain it and to process it in memory, formulating the answer based on this information.

RESULTS

Through the analysis of the results of the MMSE screening test it was found that the sample obtained a mean score obtained was 26.32 points. Since 57.5% of the sample had no cognitive deficits, 42.5% showed a cognitive deficit. In the Operational Memory Index, regarding the performance of the 22 elderly in the WAIS-III subtests, who demonstrated the mean of 101.95 (SD = 12.87), in which the minimum result was 81 and the maximum 121. In the sample of the elderly of our study, we identified that 9.09% presented superior performance. 22, 73% higher average performance and 36.36% average performance. Regarding the classification can be that the majority of the elderly had a good performance in the proposed operational memory tasks, and that the lower average index of 31.82% did not present a significant deficit. In the Digits Subtest the results of the sample evaluated indicated that the mean performance was 10.36 (SD = 2.479), the minimum percentile obtained was 6 and the maximum was 16. In terms of classification, 31.82% of the sample presented cognitive deficit, 45.45% average performance and 22.73% higher than expected. In the Arithmetic Subtest, the results of the mean sample were 10.23 (SD = 2.759), where the minimum result was 5 and the maximum of 17. In the classification, 22,27% of the sample presented cognitive deficit, 36,36% was on average and 36.36% higher than expected. In the Sequence of Numbers and Letters Subtest the mean was 10.41 (SD = 2.09), the minimum score was 6 and the maximum was 17.

Table 1. Correlation of MMSE and Operational Memory Index

	OperationalMemory Index	DigitsSubtest	ArithmeticSubtest	Sequence of Numbers and Letters Subtest
MMSE	rho = 0,713 p=0,000	rho = 0,670 p= 0,001	rho = 0,703 p= 0,001	p> 0,05
Orientation	rho = 0,497 p= 0,022	p> 0,05	rho =0,568 p=0,007	p> 0,05
ImmediateMemory	p> 0,05	p> 0,05	p> 0,05	p> 0,05
AttentionandCalculation	rho = 0,703 p=0,000	rho = 0,554 p= 0,009	rho =0,737 p=0,000	p> 0,05
Evocation	p> 0,05	p> 0,05	rho = 0,468 p= 0,032	p> 0,05
Language	p> 0,05	p> 0,05	p> 0,05	p> 0,05

With regards to the classification of this subtest, 22, 27% of the sample presented cognitive deficit, 36.36% was on average and 36,36% higher than expected. Correlation analysis was performed using the Spearman test, with a significance level of ≤ 0,05. Statistical analysis was performed using the SPSS v. 25.0.Table 1 presents the correlation of the MMSE and its subdivisions (Orientation, Immediate Memory, Attention and Calculus, Evocation and Language) with the Operational Memory Index, being composed by WAIS III subtests (Digits, Arithmetic and Sequence of Numbers and Letters) it was found that there was a significant and positive correlation (rho = 0.713 / p = 0.000).

DISCUSSION

Although the MMSE was a cognitive screening test, there was a correlation with the WAIS-III sub-tests that make up the Operational Memory Index, of elderly people in the city of Novo Hamburgo - Brazil participating in a computer course, which indicate precision, as shown in table 1. Therefore, the MMSE has been sensitive to capture improvements in the elderly who participate in memory workshops (Souza& Chaves, 2005). When the MMSE is subdivided into areas it presents an association with the WAIS III subtests that make up the Operational Memory Index. In this sense, we identified a significant correlation between the Arithmetic (WAIS III) subtest with Guidance, Evocation, Attention and Calculus (MEEM); Subtest Digit (WAIS III) with Attention and Calculus (MMSE). The Subtests Sequence of Numbers and Letters did not present any correlation with the MMSE. In this subtest the examiner is asked to repeat in ascending / alphabetical order a series of numbers and letters presented orally in an unexpected order being that the subject needs first (WECHSLER, 2004). In order to organize the numbers in ascending order and the letters in alphabetical order (WECHSLER, 2004). This leads us to reflect on the complexity of this subtest which requires, in addition to auditory memory, mental organization and planning. In the study carried out by Freitas, Alves, Simões and Santana (2013), it is pointed out that the instruments of cognitive screening are tests of easy and rapid administration, which provide a superficial (approximate) characterization of the various cognitive functions and that have indication of use in the discrimination between normal and pathological condition; these brief tests are also widely used in clinical practice as the first guidance in the detection of focal cognitive dysfunctions associated with localized brain lesions and in the evolutionary control of dementia situations. According to the findings of the study of Melo, Barbosa and Neri (2017), from the theoretical point of view, the classification made by Folstein et al. (1975) presents problems, since, for example, lack terminological accuracy in the case of Attention and Calculus.

In the elements that make up this dimension it is required that the examiner perform subtractions, but it is not clear if the level of attention required by the task is different from that required in the other elements of the instrument. Regarding the information technology group of the elderly, it should be pointed out that this activity can be a factor that contributes to the stimulation of the operational memory of the elderly in a study by Schelini et al. (2014) with 15 healthy elderly, the mean percentile obtained in the Sequence of Numbers and Letters subtest was 8 (SD = 3,62), where the maximum obtained was 12 and minimum of 0, while in our sample the results were higher than these. Still, our sample presented good results in the Arithmetic subtest, which is in line with what is reported in the literature, since in the research of Telles and Flores-Mendoza (2016), the elderly participants in a workshop of cognitive training obtained a mean of 10.29 (dp = 3,25) after the intervention. In addition, our study showed slightly higher results than the sample of healthy elderly in the study by Menezes and Nascimento (2011), where the Operational Memory Index was 99,89 (SD = 12,92) and even larger, that the sample of Trentini et al. (2009), in the Subtests Digits, where the elderly of this study presented a mean of 6,57 (SD = 2,45)

Conclusion

The results obtained here demonstrate that the MMSE can be used to evaluate operational memory with precision and reliability, especially in a context where faster application is required. Still, the results found here are in agreement with the literature on the benefits obtained through cognitive stimulation through technology, which can help both improve cognitive functions and prevent future cognitive decline. And as such, it highlights the importance of programs that offer Computer Science courses as a protective factor of declining mnemonic capacity and promoting a successful aging process is emphasized. Considering that no studies were found to support the discussion between the MMSE and the Operational Memory Index- WAIS III results in more depth, we believe that it is important to present these results in order to instigate research in the context of cognitive evaluation.

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