Correlation Between Performance in Memory Tasks, Working Activity, and Years of School in a Mexican Sample of Elderly Health Adults

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Dementia has become an actual concern considering the increasing number of elderly adults. The cost for families and society has become a real problem for the public policies in Mexico, where there is not an effective system of cognitive prevention. The objectives of this investigation were: (1) Recognize if there is a direct relation between the educational level and the maintenance of memory; and (2) Determine the presence of relations between the development of different kinds of activity in life of the adult and their influence into memory. A battery of memory tasks (immediate, mediatized, auditory-verbal, tactile, visuospatial) was applied to a sample of 80 elderly adults (40 males and 40 females) with different educational level (more than six years of education and less than 6 years). All the adults got more than 27 points in Mini Mental State Examination and had less than 10 points in the Geriatric Depression Scale. The findings of this study suggest that education is the principal factor of protection in adults; it has an outcome to compensate the effects of retirement and changing of lifestyle. Therefore, the systems of activity, which consist of what the person did during their life, also have a real effect in the possibility of older adults to pay more attention in usual activities detect their mistakes and have a better chance to recover information in their different modalities.

Keywords: aging, memory, education, activity, work

Introduction

In Mexico, as in the world, exist an increasing number of adults that are beginning to have certain cognitive deficits and there is not a usual intervention to be performed due to a lack of information about aging. It seems normal to begin to have memory complaints when people is getting older, which is wrongly understood into general population and families. Also, in Mexico there are not enough programs to attend this group of people, leaving the responsibilities to families that do not have a real training in the effects of aging and how to understand the inevitable changes reflected in everyday activities.

One of the first signs of cognitive impairment comes in the domain of memory; where there are different manifestations according with the type of activity older adults have been performing during their life. According to this, it is important, to know if there exists differences between groups of education which is the objective of this investigation. Some studies (Marx, 2005; Scarmeas & Stern, 2003) have reported that with the

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increasing of years of education, the risk to develop Alzheimer reduces and also it has a protective effect increasing the cognitive reserve of the adult.

Also, it is not the only way of protection, according to the systems of activity that a person develop in their working years, besides education, hobbies and social networks, all these elements play a role in the compensation that occurs in the speed of processing, memory and cognitive function in general (Helmut, 2003; Verghese et al., 2006). Activity could play a role according to the development and the existence of a way to prepare the adult to compensate the effects of age in an adaptative brain.

The importance of the neuropsychological research (Luria, 1980; Sereda, 2011) allowed us to analyze and determine how are established the strategies that elderly adults have to solve the tasks we proposed, that could allow us to have glimpse into their performance in daily activities. This could be achieved understanding the differences in the years of school and kind of activities they have done in a non-conscious way with their implications in the present.

Valenzuela (2008) showed that life experiences and participation in complex mental experiences have a direct influence in the brain anatomy promoting the resistance to pathology by the functional reorganization of complex mental activity and this promotes the possibility to establish a better aging prognosis and to reduce dementia risk.

It is well known that diverse working occupations modify the maps of different cortical areas, for example, taxi drivers (Woollet & Maguire, 2008) or musicians (Münste, Altenmüller, & Jäncke, 2002) have a different configuration of the structures related to the continue training and the developing of strategies (Wan & Schlaug, 2010) that will consume less resources than when they started learning the activity.

Another important concept to take in consideration is brain plasticity; Park and Reuter-Lorenz (2009) suggest that the brain is a dynamic organism seeking to maintain homeostatic cognitive function. So we are talking about the possibility that the brain has to respond to the demands of the environment (Snowdon, 2003), therefore, we are considering the possibility of the persons to reorganize the neural activity, which is related with the role of cognitive reserve in the prevention of dementia.

In this paper, we present an statistical analysis between groups of education according to their outcome in a battery of memory tasks in a group of adults that had more than 60 years of age and were living in Mexico, having as inclusion criteria Mini Mental of more than 27 points and less than 10 points in the Geriatric Scale of Depression.

Materials and Methods

Participants

A total of 80 elderly adults participated in this research; they were divided in two groups: 60 to 65 and 66 to 70 years old, both genders from Puebla, Mexico. And they were subdivided in another four groups according to the time they went to school:

Group 1 was integrated by 20 women that have less than six years of school and scored more than 27 points in Mini Mental and less than 10 points in Geriatric Depression Scale. Group 2 had the same criteria, but it was integrated by men.

Group 3 was integrated by 20 women that have less than six years of school and scored more than 27 points in Mini Mental and less than 10 points in Geriatric Depression Scale. Group 4 had the same criteria as group 3, but it was integrated by men.

Procedure

Before the application of the battery of memory tasks, every adult sign an Informed Consent Form Authorizing the participation in the study after we corroborated if they fulfill the inclusion criteria by points in MMSE and GDS. After this, every adult was assessed in a period of 80 minutes.

The study was exploratory with equivalent groups of comparison, of transversal character. We only had one measure of the four groups.

Construction of Battery of Memory Tasks

The test that we applied was composed by the next tasks:

(1) Immediate memory and mediatized (pictograms) from “Experimental Study of Memory” (Solovieva, Quintanar, & Hernández, 2001);

(2) Audio-verbal memory, tactile memory, visuomotor memory from “Neuropsychological Assessment for Adults” (Quintanar & Solovieva, 2009);

(3) Visuospatial working memory from “Battery of Executive Functions and Frontal Lobe, Spanish” (Flores, Ostrosky-Solis, & Lozano, 2008).

The scores were obtained by a qualitative and quantitative analysis observing in each task how it was performed according to the time and the number of mistakes.

Data Analysis

For statistical analysis, we employed the SPSS (Statistical Package for Social Sciences) version 18.0. It was applied one-way analysis of variance ANOVA, adjusted by Bonferroni correction with 0.05 of significance to identify the groups that were different.

Results

Table 1

Significant Tasks Between Groups of Education

Task	Sum of squares	df	Mean square	F	Sig.
Pictograms					
Number of words reminded after repetition	19.350	3	6.450	4.514	0.006
Qualitative differences of the pictograms	16.200	3	5.400	7.743	0.000
Total of words reminded after observing pictograms	99.750	3	33.250	5.929	0.001
Tactile Memory					
Right hand position recovery	2.650	3	0.883	5.048	0.003
Visuospatial working memory					
Images recovered in level 2 (5 objects)	13.938	3	4.646	3.738	0.015
Images recovered in level 3 (6 objects)	22.452	3	7.484	4.821	0.004
Audio-verbal memory					
Involuntary repetition of series 1	0.700	3	0.233	2.728	0.050
Voluntary repetition of series	8.138	3	2.713	2.700	0.052
Visuomotor memory					
Total of errors in copy, reproduction and evocation series 1	31.538	3	10.513	4.428	0.006
Total of errors in copy, reproduction and evocation series 2	23.726	3	7.909	3.508	0.019

All (80 adults were included) according to the years of school (see Table 1) were indicated the significant tasks in the statistical analysis. A one-way analysis of variance revealed significant differences between groups

presented in Table 1. We observe that the groups of education play an important role in the outcome in the results of every task.

Post hoc comparisons using the Bonferroni correction test revealed that the highest number of significant tasks between groups were by years of school (See Figure 1).

Figure 1. Comparison of significant tasks between groups by gender and years of school.

Additionally, we observed that the groups of working activity (see Table 2) revealed significant differences between groups in some of the tasks analyzed by years of school, but not in all of them, which makes us think of differences in the configuration of the memory system according to the kind of activities done in their life by the adults.

Table 2

Significant Tasks Between Groups of Education

Task	Sum of squares	df	Mean square	F	Sig.
Pictograms					
Number of pictograms produced	12.703	2	6.351	3.028	0.054
Qualitative differences of the pictograms	32.800	2	16.400	3.106	0.050
Tactile memory					
Right hand position recovery	1.348	2	0.674	3.553	0.033
Visuospatial working memory					
Images recovered in level 3 (6 objects)	23.012	2	11.506	7.547	0.001
Audio-verbal memory					
Evocation of series 1 and 2 with interference	9.450	2	4.725	7.197	0.001
Total of errors in both series	17.871	2	8.935	4.002	0.022
Visuomotor memory					
Total of errors in copy, reproduction and evocation series 1	41.744	2	20.872	9.440	0.000
Total of errors in copy, reproduction and evocation series 2	15.822	2	7.911	3.394	0.039

Discussion

The present study supports the idea that education is the variable most important between groups of elderly adults. Neuropsychological assessment provide results to observe differences in each one of the tasks provided, most of them take into consideration the group of men with less than six years of school comparing them with the others (Wang et al., 2005; Hall et al., 2007).

It is proposed that this effect as also a psychological effect into the cognitive configuration. A good example in the case of Mexican men is that when they are retired from work, in most of the cases, there is not an equal activity when they can structure their life to have a fulfilling sense of being, and the memory performance is decreased. It is important to consider that the group of population that we selected corresponds to certain parameters of successful aging.

It is possible to remark the differences that we find between genders, what makes us believe that the differences of the type of work that the groups and the requirements of those changed the way the information is functionally processed. Thus, the effect is not presented if we compare the groups by gender with more than six years of school.

According to the data of the working activity, it can be said that each one of the three groups were generated by a formula that allowed us to include the years of work, time of retirement, hobbies, current activity, and school years. Three groups were obtained, lower activity, medium and high, and we observed that in the comparison there are better performances in the higher group according to the diversity of their life, this can be observed in other studies (Polidori, Nelles, & Pientka, 2010; Boyle, Buchman, Wildon, Yu, Schneider, & Benett, 2012; Garret, Grady, & Lynn, 2010).

However, it is important to consider that in this study we focus our analysis in persons that have a healthy aging, which has to ponder areas like psychological, social, and cultural. We believe that in further studies, we need to compare our sample to another with different socioeconomic status and different geographical location.

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