Physical activity and cognitive impairment in older adults

Actividad física y el deterioro cognitivo en adultos mayores

Atividade física e comprometimento cognitivo em idosos

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ABSTRACT

The aim of this study was to determine the relationship between physical activity and cognitive impairment in older adults. This research has a quantitative approach, non-experimental design, cross-sectional, descriptive and causal type that evaluated 203 subjects using the Pfeiffer Questionnaire (SPMSQ) and the International Physical Activity Questionnaire (IPAQ). Regarding physical activity, the results obtained show that 33.99% of those evaluated have moderate physical activity, 33% have high activity, and 21.67% have low activity levels. Besides cognitive impairment, 71.43% have no impairment, 16.26% have a mild impairment, and 12.32% have moderate impairment. In addition, in the regression analysis it was determined, at a confidence level of 95%, that physical activity is related to cognitive impairment ($p=0.02$, $p<0.05$). Finally, it was concluded that physical activity is related to cognitive impairment in older adults.

Key words: Physical activity, Cognitive impairment, Older adult.

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RESUMEN

El objetivo del presente estudio fue determinar la relación entre la actividad física con el deterioro cognitivo en adultos mayores; esta investigación tiene un enfoque cuantitativo, de diseño no experimental, transversal, de tipo descriptivo y causal que llegó a evaluar a un total de 203 sujetos mediante el cuestionario de Pfeiffer (SPMSQ) y el cuestionario internacional de actividad física IPAQ. Con respecto a los resultados se encontró que, en la actividad física un 33.99% de los evaluados tienen actividad moderada, un 33% tiene actividad alta y un 21.67% tiene actividad baja; en el deterioro cognitivo un 71.43% no cuenta con deterioro, un 16.26% tiene un deterioro leve y un 12.32% tiene un deterioro moderado; en el análisis de regresión se determinó, a un nivel de confianza del 95%, que la actividad física se relaciona con el deterioro cognitivo (p=0.02, p<0.05). Finalmente, se llegó a la conclusión de que la actividad física si tiene relación con el deterioro cognitivo en los adultos mayores.

Palabras Clave: Actividad física, Deterioro cognitivo, Adulto mayor.

RESUMO

O objectivo deste estudo foi determinar a relação entre a actividade física e a deficiência cognitiva em idosos, esta investigação tem uma abordagem quantitativa, desenho não experimental, transversal, descritiva de tipo causal que veio avaliar um total de 203 sujeitos utilizando o questionário Pfeiffer (SPMSQ) e o questionário internacional de actividade física IPAQ. Com respeito aos resultados, verificou-se que 33,99% dos avaliados tinham um Nível de atividade física moderada, 33% tem um nível de atividade física elevada e 21,67% tinham um Nivel de atividade fisica baixa, 71,43% não tinham nenhuma deficiência cognitiva, 16,26% tinham uma deficiência ligeira e 12,32% tinham uma deficiência moderada; na análise de regressão foi determinado, a um nível de confiança de 95%, evidencia que a atividade física esta relacionada com a deficiência cognitiva (p=0,02, p<0,05). Finalmente, concluiu-se que a actividade física está relacionada com uma deficiência cognitiva em idosos.

Palavras chave: Atividade física, Deficiência cognitiva, Adulto mais velho.

INTRODUCTION

The older adult population has been growing in recent years; according to the United Nations [UN] (2019) between 2015 and 2030, the population aged 60 years and over will grow by 56% with approximately 2.1 billion older adults in the world. Likewise, in Latin America and the Caribbean, the growth expectation in about 15 years is 71%, being the highest worldwide, which reflects a great growth of the older adult population in all these areas and Peru is no stranger to this reality since according to the National Institute of Statistics and Informatics [INEI] (2020) it was reported that there are approximately 4,140,000 older adults over 60 years of age, representing 12.7% of the total population. During aging, a series of changes occur, both physical, psychological and mental, where a diversity of problems usually arise according to the condition of the people, leading to a series of physical and mental illnesses typical of deterioration, due to age and depending on the quality of life they had in the development of their life, in which factors such as diet, personal care, physical activity and previous illnesses, among others, are determinants of well-being at this stage (Torres & Arias, 2019).

Among these diseases in older adults, the most frequent are those linked to cognitive decline, which, according to Ayala (2020), has led to an increase in the prevalence of neurodegenerative diseases worldwide; it is aging. In this regard, the World Health Organization [WHO] (2020) stated that cognitive decline affects the world; it is estimated that between 5% and 8% of the total, aged 60 years or older, suffer from cognitive decline at some point

in their lives; in addition, it recognizes this as a public health priority.

Cognitive decline in older adults refers to the fact that the person begins to have difficulties in their intellectual functioning, aspects with which they function in an environment and interact with other people. In the case of older adults, as a result of age, a series of variations occur at the morphological, metabolic, circulatory and biochemical levels that, according to brain plasticity, will determine or not some type of cognitive alterations, decreased volume of the cerebral cortex, neuronal volume, synaptic changes, decreased pyramidal cells, decreased blood flow, among other aspects, such as decreased memory, verbal fluency, reasoning, speed of analysis and efficiency in their activities (Benavides, 2017).

This is how cognitive decline generates the loss of a series of cognitive functions, which will directly depend on aspects such as physiological, psychological and social ones, so it is important to generate a synergy in all these aspects within the development of people, since they all work together generating well-being, which is why the quality of life they maintained will be another important aspect in the cognitive impact of people (Parada et al., 2022).

According to Barrera (2021) the changes adopted by the elderly are a consequence of physiological modifications due to age; physical activity, although it does not prevent them, delays their appearance and slows their progression; in older adults, physical activity contributes to improving flexibility, strength, coordination and balance; in the same way, it improves self-esteem and delays cognitive decline. In this regard, Aldas et al. (2021) assure that physical activity can improve physical and mental health, improve productivity and prevent certain diseases through work breaks and other activities. Finally, this is confirmed by the WHO (2020) stating that physical activity is beneficial for mental health, as it prevents cognitive decline.

In addition, it is important to note that under the current conditions experienced as a result of the presence of the COVID-19 pandemic and the state of health emergency, a negative effect on people's cognitive development has undoubtedly been detected, as stated by Bombón & Suárez (2022); Rodríguez & Guapisaca (2022); Negrete et al. (2021); Russo et al. (2021), who in the development of their research managed to determine that the physical and mental health of older adults have been affected by this situation, and it also has a negative effect on cognitive development, so it is important to be able to generate public health strategies that allow these conditions to be improved, and one of them is to encourage the practice of physical activity, which is an important prevention aspect to address this problem.

The development of this work is relevant on a theoretical level, since it presents systematized information on the variables, allowing their understanding and approach, which should be useful as a reference for the development of future research that works with these variables. On a methodological level, it contributes by providing information on the relationship between physical activity and cognitive impairment, which will allow us to know to what degree this effect occurs, which is important to the extent that it allows us to give greater importance to this activity through adequate scientific support. Finally, it is important on a practical and social level since knowing the link between the variables provides information with support to the older adults who were part of the evaluation and their peers, seeking to raise awareness of the practice of physical activity, these aspects being a valuable contribution to their general well-being since it contributes to

improving aspects related to their physical and mental health. Thus, based on all the above, the main objective is to determine the relationship between physical activity and cognitive impairment in older adults; In this way, we seek to highlight the importance of developing this activity in people, since it has great benefits for their general well-being.

METHODS

The present study has a quantitative approach based on the development of statistics to achieve the objectives set, in addition, it has a non-experimental design, without performing any manipulation on the variables studied, and is transversal, since the measurement process was carried out at a single point in time, in addition, it is descriptive and correlational, since it describes the nature of the variables and is based on determining the relationship or degree of association between two or more concepts, categories or variables in a particular sample (Hernández-Sampieri et al., 2014).

Participants

It was made up of all the older adult members of the Seventh-day Adventist Church in the José Carlos Mariátegui district in San Juan de Lurigancho and the Lurín District, registered in the membership book, making a total of 250 older adults. To calculate the sample, a census-based, non-probabilistic and convenience sampling was taken into account, that is, all the elements of the population do not depend on probability, but on the characteristics of the research (Hernández-Sampieri et al., 2014). In addition, inclusion criteria were considered such as being 60 years of age or older, wishing to participate voluntarily in the evaluation and, as exclusion criteria, not having informed consent, not completing the evaluations completely, reaching a sample size of 203 subjects, distributed as shown in Table 1.

Table 1

Sample distribution according to sociodemographic variables.

Variables		f	%
Age	60 to 69 years	115	56.65%
	70 to 79 years	42	20.69%
	80 years or older	46	22.66%
Sex	Female	105	51.72%
	Male	98	48.28%
Marital status	Married	143	70.44%
	Cohabitant	6	2.96%
	Divorced	4	1.97%
	Single	5	2.46%
	Widowed	45	22.17%
Residence	Urban	177	87.19%
	Rural	26	12.81%
Place of origin	Coast	71	34.98%
	Mountain region	131	64.53%
	Jungle	1	0.49%
	Total	**203**	**100.00%**

Instruments

Cognitive impairment was assessed using the Pfeiffer questionnaire (SPMSQ) validated in Peru by Rodríguez (2021), which consists of ten questions, which assesses orientation, information, memory, and simple calculation. This questionnaire is a screening test, applicable to illiterate subjects and older adults; where the following are considered normal: 0 to 2 errors, mild cognitive impairment: 3 to 4 errors, moderate cognitive impairment: 5 to 7 errors, and severe cognitive impairment: 8-10 errors. Regarding the reliability of the instrument, it was analyzed using the internal consistency coefficient of Cronbach's alpha, which has a value of 0.82, this value being adequate for its use (Angamarca et al., 2020).

The physical activity variable was assessed with the International Physical Activity Questionnaire (IPAQ) validated in Peru by Nuñez (2022). The short version of the IPAQ consists of 7 items and assesses three characteristics of physical activity (PA): intensity (light, moderate, or vigorous), frequency (days per week), and duration (time per day). Weekly activity is recorded in Mets (Metabolic Equivalent of Task or Metabolic Rate Units) per minute and week. The reference Mets values are shown below: Walking: 3.3 Mets; moderate physical activity: 4 Mets; vigorous physical activity: 8 Mets. To obtain the number of Mets, each of the previously mentioned values (3.3, 4, or 8 Mets) was multiplied by the time in minutes of performing the activity in one day and by the number of days per week that it is performed. Regarding the reliability of the scale, it was calculated using the Cronbach's alpha coefficient, which obtained a value of 0.65, showing an acceptable level of reliability (Cancela et al., 2019)

Statistical Techniques

The data were entered into the SPSS V-24 program, where the database was created based on the variables, the data was cleaned and coded to then calculate the descriptive statistics such as frequencies and percentages according to the sociodemographic variables, subsequently the simple linear regression analysis was performed in order to determine the relationship of physical activity with cognitive impairment, and also to determine the relationship between the variable physical activity with the dimensions of cognitive impairment.

Ethical aspects

For the development of this study, permission was requested from the ethics committee of the Universidad Peruana Unión, and respect for the privacy of the participants' information was taken into account, making use of the informed consent where each of the subjects who were part of the sample decided to participate in the development of this research voluntarily and anonymously. Likewise, what was stated by CONCYTEC in 2019 was taken into account, which refers to the proper use of information, making the correct use of citations and sources (Carlessi, et al., 2019), in order to avoid any type of plagiarism, guaranteeing the correct development of scientific production.

RESULTS

Table 2 shows the levels found with respect to physical activity and cognitive impairment. With respect to physical activity, 33.99% have a moderate level of physical activity, followed by 33% who have a high level of physical activity. , 21.67% have a low level of physical activity and 11.33% do not have any type of physical activity. It is worth mentioning that the classification was made based on the use of percentile cut-off points, considering the 33rd and 66th percentile (whose direct scores are 303.72 and 1032.24 [Met x week], respectively).

Table 2

Levels of physical activity.

Levels		f	%
Physical activity	None	23	11.33%
	Low	44	21.67%
	Moderate	69	33.99%
	High	67	33.00%
Total		**203**	**100.00%**

Regarding the results of cognitive impairment, Table 3 shows that: 74.43% did not have any type of cognitive impairment; 16.26% had mild cognitive impairment and 12.32% had moderate cognitive impairment; no cases of severe impairment were evident among those evaluated.

Table 3

Levels of cognitive impairment.

Levels		f	%
Cognitive impairment	Normal	145	71.43%
	Mild impairment	33	16.26%
	Moderate impairment	25	12.32%
Total		**203**	**100.00%**

In order to achieve the stated objective, which focuses on identifying that physical activity is related to cognitive impairment, as shown in Table 4, the linear regression analysis between the two proposed variables where at a confidence level of 95% significant values are seen ($p=0.02$; $p<0.05$) therefore it is concluded that there is a relationship between physical activity and cognitive impairment, said effect is negative, so it is understood that the greater the physical activity, the lower the cognitive impairment.

Table 4

Linear regression between physical activity and cognitive decline.

Model		Non-standardized coefficients		Standardized coefficients	t	F	p	R	R2
		B	Error	Beta					
Dependent variable: Cognitive impairment	(Constant)	2.27	0.15		14.65	5.52	0.02	0.16	0.027
	Physical activity	0.00	0.00	-0.16	-2.35				

Table 5 presents the regression analysis to identify the relationship between physical activity and the dimensions of cognitive impairment, where at a confidence level of 95% it is identified that there is a significant relationship between physical activity and the dimension of orientation (p=0.00; p<0.05) and information (p=0.00; p<0.05); there is no evidence of a relationship between physical activity and the dimension of memory and simple calculation.

Table 5

Linear regression between physical activity and dimensions of cognitive impairment.

Model		Non-standardized coefficients		Non-standardized coefficients	t	F	p	R	R2
		B	Error	Beta					
Dependent variable: Orientation	(Constant)	2.58	0.05	0.20	45.05	8.37	0.00	0.20	0.04
	Physical activity	8.90	0.00		2.89				
Dependent variable: Information	(Constant)	2.55	0.04	0.20	54.48	8.63	0.00	0.20	0.04
	Physical activity	7.39	0.00		2.94				
Dependent variable: Memory	(Constant)	2.14	0.06	0.11	34.18	2.23	0.14	0.11	0.01
	Physical activity	5.01	0.00		1.49				
Dependent Variable: Simple Calculation	(Constant)	0.48	0.04	-0.06	10.95	0.80	0.37	0.06	0.00
	Physical activity	-2.08	0.00		-0.89				

DISCUSSION

The main objective of the development of this study was to determine whether physical activity is related to cognitive decline in a group of older adults. Thus, through linear regression analysis, significant values with negative statistics were found, so it was determined that the greater the physical activity, the lower the cognitive decline of those evaluated. This indicates that the development of physical activity in older adults is an important aspect that contributes to their health, so the practice of this activity leads to a series of benefits, and can prevent cognitive decline. In addition, the relationship between physical activity and the dimensions of cognitive decline was identified, within which the significant relationship of physical activity with

the dimension of orientation and information was identified, which indicates that the development of physical activities must be related to the way in which people maintain their levels of orientation, in the same way as maintaining the levels of information. In this regard, Castro & Galvis (2018) mention that the practice of physical activities generates a series of favorable changes in the body, in addition to bringing benefits at the emotional, behavioral and social level that are linked to the improvement of the general well-being of people, resulting in a better quality of life; it is worth mentioning that it is important to take into account the type of physical activity that older adults can perform, as stated by the authors. In addition, Roca (2016) observed that a regular practice of physical activity impacts having or maintaining social relationships, which are the basis of their psychological health. Duque et al. (2020) suggest that older adults choose physical activities that suit their current condition and performance, taking into account how important it is to have control of vital functions to avoid any type of risk and over-demand. Likewise, it is important to follow an adequate guide of the exercise plan, preferably guided by a professional, who can prevent the appearance of injuries and adapt the activity according to the particular needs of each person.

In Ecuador, Chimbo et al. (2016) found that 45% of older adults had a high level of physical activity, 37% a moderate level, and 18% a low level. However, in a study conducted in Chile, Poblete et al. (2016) found that, regarding physical activity, 51.6% had a moderate level, 36.7% a low level, and 11.7% a high level of physical activity. Likewise, in the present study, it was found that 33.9% had a moderate level of physical activity, followed by 33% with a high level, and 21.6% with a low level of physical activity. On the other hand, regarding cognitive impairment, Pérez-Hernández et al. (2018) identified 51% with moderate impairment, 26% with mild and 25% with severe impairment, and 34% of older adults did not present cognitive impairment. In contrast, Sotomayor et al. (2022) found that 80.8% do not present cognitive impairment, 17.0% have mild cognitive impairment, and 21.3% have severe cognitive impairment. Regarding the present study, it was identified that 71.43% do not have any type of cognitive impairment, 16.2% have mild cognitive impairment, and 12.3% have moderate cognitive impairment.

There are various studies (Aldas et al., 2021; Font-Jutglà et al., 2020; Reyes & Campos, 2020; Torres et al., 2020; Salazar & Calero, 2018) that consider that the development of physical activity in the elderly leads not only to a level of prevention of cognitive impairment, but also brings with it a series of benefits for the physical and psychological health of people. According to Bonilla & Medina (2017) regarding the relationship between physical activity and cognitive decline, this was shown to be statistically significant with a chi-square value of 345.2 and a $p<0.05$, and the contingency coefficient shows a strong and also statistically significant relationship. In the present study, a linear regression analysis was performed between the two proposed variables where, at a confidence level of 95%, significant values are observed ($p=0.02$; $p<0.05$), so it is concluded that there is a relationship between physical activity and cognitive decline.

Based on the results obtained by Coelho (2018) in his study, he detected that there was a statistically significant positive correlation between the memory dimension and physical activity during the time that vigorous and moderate physical activity is performed. In a research carried out by Kumar et al. (2022), who studied a group of Indian elderly, the results indicated that older adults who perform frequent physical activity have greater cognitive

impairment, which was measured through five dimensions (memory, orientation, arithmetic function, executive function, and object naming), than older adults without physical activity. In this study, through regression analysis, it was found that there is a significant relationship between physical activity with the orientation dimension ($p = 0.00$; $p < 0.05$) and information ($p = 0.00$; $p < 0.05$), but there is no evidence of a relationship between physical activity with the memory dimension and simple calculation.

Similarly, the results presented are similar to the findings of Ballarin et al. (2021); Ramos et al. (2021); Cigarroa et al. (2020); Nazar et al. (2020); Russo et al. (2020); Haeger et al. (2019); Jia et al. (2019); Park et al. (2019); Poblete-Valderrama et al. (2019); Brasure et al. (2018); Castro & Galvis (2018) and Sanchez et al. (2018), who determined that physical activity is a factor that prevents cognitive decline in people, so it is important to be able to promote these activities in older adults, allowing them to obtain a series of benefits at a physical and psychological level. Among the main strengths found in the present study, the relationship between physical activity and cognitive decline in a specific population, older adults, must be identified. This allows us to revalue the practice of these activities, since it is related to better health. This is important since it allows us to promote a better quality of life in search of greater well-being. Therefore, it is necessary to further encourage the development of these activities in the aforementioned group and generate habits that promote their health (Castro & Galvis, 2018). As a weakness of the study, it is considered that greater precision is required with respect to the specific physical activity, that is, that the effect of various physical activities on cognitive decline could be developed in other research with larger samples, and to determine, within the group of physical activities, which ones have better results, in order to recommend a specific physical activity. Based on the results found, it is recommended as a future research direction to replicate the study in different contexts and different regions, with a sample composed of older adults of different age ranges, with the objective of identifying the behavior of the variable with the predictor variable method and inferential analysis, probabilistic studies, analysis of predictor variables, among others, with the objective of being able to generate greater social awareness about the importance of including physical activity as a factor that promotes better health and general well-being within the population.

CONCLUSION

There is a relationship between physical activity and cognitive decline, which indicates that the higher the level of physical activity, the lower the cognitive decline in older adults.

The level of physical activity found in older adults is 66.9%, which indicates that they perform moderate to high physical activity, that is, the majority of the population studied, despite their age, still take regular walks and play sports, among others, indicating that they still maintain their physical condition to perform these activities.

Regarding the cognitive decline found in older adults, 71.43% do not have any type of deterioration, this result shows that most older adults have a lower possibility of rapid loss of cognitive functions such as: orientation, information, memory and simple calculation.

There is a relationship between physical activity and the orientation dimension of the cognitive decline variable, that is, if the level of physical activity is higher, then the sense of orientation is better, which implies optimal orientation in time, space and person.

There is a relationship between physical activity and the information dimension of the cognitive impairment variable, that is, the higher the level of physical activity, the greater the sense of information, in other words, the knowledge of personal information.

Finally, it was shown that there is no relationship between physical activity and the dimensions of memory and simple calculation of the cognitive impairment variable, this indicates that even if there is or is not some type of constant physical activity, this does not affect their memory (short and medium term) in any way, nor does it influence their knowledge of simple calculation (subtraction).

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