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La aptitud física y la capacidad cognitiva en estudiantes de cultura física de una universidad pública del noroeste de México

Cognitive Ability and Physical Fitness in Students of Physical Culture of a Public University in Northwestern Mexico

Aptidão física e capacidade cognitiva em estudantes de cultura física de uma universidade pública do noroeste do México

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Resumen

El ser humano sano mantiene un equilibrio biopsicosocial. La salud física y mental están estrechamente vinculadas e impacta en la productividad, funcionalidad y adaptabilidad a las exigencias cotidianas. Se espera que la interrelación de las distintas dimensiones humanas se manifieste proporcionalmente, esto es, a mayor salud física, mayor capacidad intelectual o viceversa. Este estudio parte del supuesto de que las personas que hacen ejercicio frecuentemente pueden gozar de mayor salud y registrar un mayor rendimiento cognitivo o mental que las personas que no se ejercitan con regularidad.

El principal objetivo de esta investigación ha sido describir la relación entre la dimensión cognitiva y la dimensión física en estudiantes de licenciatura en cultura física y deporte de una universidad pública del noroeste de México. Lo anterior para conocer las características psicofísicas de los alumnos y poder proponer estrategias educativas adecuadas a su nivel de maduración, buscando potenciar su rendimiento y aprovechamiento escolar.

El diseño de la investigación fue no experimental con enfoque cuantitativo. Se aplicó una batería de diversas pruebas cognitivas y físicas a 90 estudiantes de tercer semestre de dicha carrera para obtener un indicador global de la dimensión física y se recolectaron cuatro indicadores que constituyeron la dimensión cognitiva. Las variables se cruzaron para obtener el coeficiente de correlación de Pearson y verificar su significatividad estadística.

En ambos sexos se encontró una relación positiva estadísticamente significativa entre las variables de inteligencia general obtenidas con el test de Dominó y el Exhcoba, que se utiliza como filtro de ingreso a la universidad. Además, se encontró correlación positiva entre las variables abdominales y salto horizontal. Se destaca, asimismo, la heterogeneidad de la población estudiada con respecto a sus hábitos para la ejercitación física y el desarrollo de las capacidades cognitivas. Finalmente, se concluye que la existencia de un dimorfismo sexual establece marcadas diferencias entre los sexos. Sin embargo, no se encontró correlación significativa entre la dimensión física y la dimensión cognitiva. Los resultados sugieren que es la apropiación de la cultura, la educabilidad del ser humano, la que impulsará un mayor desarrollo cognitivo y físico.

Palabras clave: capacidad cognitiva, capacidad física, educación física, estudiantes, universidad.

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Abstract

The healthy human being maintains a biopsychosocial balance. Physical and mental health are closely linked and impact on productivity, functionality and adaptability to daily demands. It is expected that the interrelation of the different human dimensions will manifest proportionally, that is, to greater physical health, greater intellectual capacity or vice versa. This study starts from the assumption that people who exercise regularly can enjoy greater health and register a greater cognitive or mental performance than people who do not exercise regularly.

The main objective of this research was to describe the relationship between the cognitive dimension and the physical dimension in students of the Degree in Physical Culture and Sports of a public university in northwestern Mexico to know the psychophysical characteristics of students and to propose strategies educational programs adapted to their level of maturity, seeking to enhance their performance and school achievement.

The design of the research is non-experimental with a quantitative approach. A battery was applied several cognitive and physical tests to 90 students of the third semester to obtain a global indicator of the physical dimension and four indicators were collected that constituted the cognitive dimension. The variables were crossed to obtain the Pearson correlation coefficient, verifying its statistical significance. In both sexes, a statistically significant positive relationship was found between the variables of general intelligence obtained with the Domino Test and the Exhcoba Test, which is used as a filter for admission to the university, and a positive correlation was found between abdominal variables and horizontal jump.

The heterogeneity of the population studied is highlighted with respect to their habits for physical exercise and the development of cognitive abilities. Finally, it is concluded that the existence of a sexual dimorphism establishes marked differences between the sexes, however, no significant correlation was found between the physical dimension and the cognitive dimension. The results suggest that it is the appropriation of the culture, the educability of the human being, which will promote greater cognitive and physical development.

Keywords: cognitive ability, physical capacity, physical education, students, university.

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Resumo

O ser humano saudável mantém um equilíbrio biopsicossocial. A saúde física e mental está intimamente ligada e impacta na produtividade, funcionalidade e adaptabilidade às demandas cotidianas. Espera-se que a inter-relação das diferentes dimensões humanas se manifeste proporcionalmente, ou seja, maior saúde física, maior capacidade intelectual ou vice-versa. Este estudo baseia-se no pressuposto de que as pessoas que se exercitam com freqüência podem desfrutar de maior saúde e registrar um desempenho cognitivo ou mental maior do que as pessoas que não se exercitam regularmente.

O objetivo principal desta pesquisa foi descrever a relação entre a dimensão cognitiva e a dimensão física em estudantes de graduação em cultura física e esportes em uma universidade pública do noroeste do México. O anterior é conhecer as características psicofísicas dos alunos e poder propor estratégias educativas adaptadas ao seu nível de maturação, procurando melhorar o seu rendimento e vantagem escolar.

O desenho da pesquisa foi não experimental com uma abordagem quantitativa. Uma bateria de diversos testes cognitivos e físicos foi aplicada a 90 alunos do terceiro semestre daquela carreira para obter um indicador global da dimensão física e foram coletados quatro indicadores que constituíram a dimensão cognitiva. As variáveis foram cruzadas para obter o coeficiente de correlação de Pearson e verificar sua significância estatística.

Em ambos os sexos, foi encontrada uma relação positiva estatisticamente significante entre as variáveis gerais de inteligência obtidas com o teste Domino e o teste Exhcoba, que é utilizado como filtro para a entrada na universidade. Além disso, foi encontrada correlação positiva entre as variáveis abdominais e o salto horizontal. Destaca também a heterogeneidade da população estudada em relação aos seus hábitos de exercício físico e desenvolvimento de habilidades cognitivas. Finalmente, conclui-se que a existência de um dimorfismo sexual estabelece diferenças marcantes entre os sexos. No entanto, nenhuma correlação significativa foi encontrada entre a dimensão física e a dimensão cognitiva. Os resultados sugerem que é a apropriação da cultura, a educabilidade do ser humano, que promoverá maior desenvolvimento cognitivo e físico.

Palavras-chave: capacidade cognitiva, capacidade física, educação física, estudantes, universidade.

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Introduction

The interest for the understanding of the human mind began more than 2000 years ago, but it is not more than 120 years that the mind has been studied under the scientific paradigm (Medina, 2008). However, the holistic paradigm of the study of the human being has returned much interest in the last decades.

The human being as a biopsychosocial and ecological reality is constituted by an intimate relationship between body and mind. The human being as a whole unit is socially constructed: it is the protagonist of its own process of humanization through education. In this sense, the concept of corporeality appears as a key to integral development.

Corporeity "is inscribed within the human condition, insofar as it recognizes biological determinism of a phylogenetic order, but transcends it and relates it to the processes of social interaction and cultural mediation of ontogenetic order" (Hurtado, 2008, p.120).

Recent studies suggest undertaking academic work after physical exercise (Pirrie and Lodewyk, 2012) because there is a positive association between physical activity and the development of directive functions (Booth et al., 2013) and attentional inhibition (Hillman et al., 2009), indispensable factors in school performance.

From the intellectual perspective and based on the theory of multiple intelligences established by Gardner (2011), students of careers related to physical culture and sports have a kinesthetic or kinetic intelligence that influences the development of their motor skills and intellectuals. However, there is the concern to know if motor activity, physical exercise and sports really contribute to the development of intelligence and deep thinking.

In some Latin American countries such as Mexico, Ecuador, Cuba and Chile, to mention just a few, applicants to study a degree related to physical culture, physical activity or education and sports have an income profile below the average of rest of the university students. And despite the fact that the vast majority of students of these university careers frequently practice some sport or perform physical exercise on a frequent basis, their school performance is usually very low. In a study conducted by Gavotto, Tapia y Castellanos (2013) on the mastery of the academic contents

of undergraduate students in sports training at a public university in northwestern Mexico, a general knowledge test was applied to the main subjects taught in the second semester to third, fifth and seventh semester students to identify their level of retention of information and all students failed the exam - it was not possible to identify a difference in the outcome of the three groups.

On the other hand, and in a general way, Mondragón, Cardoso and Bobadilla (2017) point out that academic performance in undergraduate students is due to factors such as the social, family, economic and some more complex contexts such as cognitive, affective and emotional structures. of each student; but not precisely to study habits.

So, going back to the students of careers related to physical activity, it can be speculated that students do not dedicate the necessary time to academic tasks because they are more interested in practicing their favorite sport and exercising their body . In addition, a determining factor is the lack of selective attention during the teaching process.

In this regard, Gavotto and Castellanos (2015) identified the stability of the selective attention of the university student in the field of physical activity during the educational process to recognize the effective time of attention and the intensity that requires a didactic stimulus to reduce distractions in class. , and reached the conclusion that most students consider that they only maintain 70% attention during one hour of expository class.

And in the same vein, Maureira, Flores and Ravanal (2015) consider it essential to know the level of general intelligence of students in physical education to establish scales that facilitate teachers to develop teaching strategies according to the particular characteristics of this population.

The problem arises in the inconsistency of scientific evidence about the association or relationship between the level of general intelligence and the practice of frequent physical exercise in active (non-sedentary) people. On the one hand, some research confirms that physical exercise favors cognitive development; on the other, other studies indicate that people with greater cognitive interest are more passive or sedentary.

Faced with this dilemma, the initial hypothesis proposed here is mainly influenced by the first way, namely, that students who perform more physical activity or practice sports have a greater ability to concentrate and pay more attention during classes, obtain a level of general

intelligence and have a better school performance than students who do not practice physical exercise on a frequent basis.

Also, this situation, to ignore the existence of correlation between the cognitive and physical dimensions in students, allowed generating the following research questions:

1) Is there a correlation between the cognitive dimension and the physical dimension of the students?

2) What are the differences between men and women in the cognitive and physical dimensions?

Undoubtedly, scientific evidence confirms that all systems and devices of the human body are functioning well with frequent practice of exercise.

Recent research on the functioning of the brain has used imaging technology such as tomography, electroencephalograms and functional magnetic resonance to monitor blood flow and electrical activity, which has allowed a breakthrough in the field of neurosciences. So there has been a great interest in knowing the modifiable factors that cause brain neurodegeneration.

Researchers affiliated with the Salk Institute of Biological Studies in San Diego, USA, have conducted several experiments with mice that have allowed them to ensure that those who exercise are often more "smart", since they manage to find the exit in a labyrinth. For example, Gage (cited in Reynolds, 2014) confirmed that more "athletic" mice show much greater neurogenesis than sedentary mice. It should be noted that, as with mice, humans also present neurogenesis, which is mainly concentrated in the hippocampus.

And digging a little deeper: one of the functions of the hippocampus is the creation and processing of memories, so that its state affects human cognition, a basic ability to think, learn and remember. Unfortunately, as the human being ages, the brain tends to shrink its volume, and one of the brain areas most prone to reduce its volume is the hippocampus. Neuroscientists consider that the loss of neurons in the hippocampus may be the main cause of cognitive deterioration, it can even be associated with diseases such as Alzheimer's (Reynolds, 2014).

With regard to research conducted with active older adults, they have been limited to the evocation or recall of photographs. That is, it is limited to identifying what has been achieved or obtained and not to a general intelligence index or cognitive aptitude, so it is suggested to carry out more precise investigations in this age group, testing their capacity to learn new knowledge structures.

It is important to consider that exercise favors the state of health, which allows us to preserve the functions of our bodies, and the greater the health, the better the functioning of all organs, including the brain. However, learning involves a complex cognitive process, which is associated with the culture and mental structures of each human being, so it is essential to have a healthy organic structure to be able to retain or apprehend new information. It is also important to point out that the greater the activity recorded in the brain, the greater the power of learning and remembering new experiences.

Scientifically it has been proven that the human brain has the ability to renew itself and the frequent practice of physical exercise accelerates this process of cell renewal. According to Gage (cited in Reynolds, 2014) our behavior can change the structure of the brain, that is, that exercise can influence cell renewal. Scott A. Small (cited in Reynolds, 2014), from the Department of Genetics at Columbia University in New York, United States, suggests that hippocampal shrinkage, a common phenomenon in the aging process, could be delayed by exercise at There is a greater flow of blood in this part of the brain. This is aligned and confirmed by what was shown in a study carried out with university students, where significant improvements were made in their memory in a test of evocation of words after having exercised for three months. In addition, the people who had increased their maximum VO2 maximally obtained the best grades in the memorization test.

Sin embargo, a pesar de la pérdida de capacidades cognitivas con el encogimiento o reducción del hipocampo, no se puede asegurar que el tamaño del hipocampo sea determinante para el aprendizaje, puesto que las mujeres generalmente tienen un hipocampo más pequeño que los hombres y pueden lograr un mayor desarrollo emocional. El menor desarrollo en los hombres puede deberse a una menor estimulación de sus potenciales habilidades emocionales (Mathiesen, Castro, Merino, Mora y Navarro, 2013).

In line with most of what is expressed here, Merrill (2014) highlights the potential of physical exercise to maintain function and brain health; his studies confirm the influence of physical exercise to keep the brain in optimal health at different stages of development and its impact on memory conservation in older adults. Even Merrill (2015) has presented scientific evidence at the molecular level that confirms the need to maintain body weight, perform physical exercise frequently and take an adequate diet, considering that the modification of these factors causes an important effect on cognitive functions and memorization, essential skills for less

dependent aging and better quality of life. Thus, it confirms that a person who performs physical exercise frequently is in better working conditions to learn than people who do not perform physical activity.

On the other hand, there are other studies that have not found a relationship between physical abilities and intelligence tests or cognitive ability. In this line, Gavotto, Valencia and Tapia (2014) measured the relationship between reaction speed and intelligence in young undergraduate students in sports training and did not find a relationship between the variables of intelligence and reaction speed, so they rejected the possibility to make predictions of competition among these.

Researchers such as McElroy, Dickinson, Stroh and Dickinson (2016) have found that the cognitive needs expressed by university students, considered as the tendency to participate and enjoy cognitive effort and obtained through the instrument Need for Cognition -translated here as a test of needs cognitive-, proposed by Cacioppo and Petty in 1982 [(McElroy et al., 2016), are lower in those who perform more physical activity. This means that participants in the study who performed more physical activity for a week expressed less interest in performing cognitive processes or participating in activities that require thinking deeply about a particular topic.

It is evident that the biological and cultural factors are determinants in the cognitive development of the people, therefore, to make physical exercise of frequent way is result of a cultural factor that affects at organic level and has favorable effects in the health, which provides the optimal conditions for the person to develop their cognitive capacity and intelligence. However, there is the possibility that people who are organically limited or who do not have a biopsychosocial balance have difficulties in learning and voluntarily refuse to participate in cognitive activities that involve applying thinking skills, preferring to perform physical rather than intellectual activities. And the same thing can happen in the opposite direction: people with a great intellectual potential are likely to prefer to devote more time to the development of thought than to the practice of sports or physical activities in general.

Cognitive differences between men and women

Scientific studies have proven the cognitive differences between men and women. These neuroanatomical and functional differences between men and women are known as sexual dimorphism.

A region with evident sexual and functional dimorphism is the hippocampus, structure related to learning and memory. For example: in tasks of memory of spatial work in women the activation of the left hippocampus predominates and in men the activation of the right. This, in turn, influences cognitive processing strategies: women use verbal strategies more in the face of this type of task (Nastoyashchaya and López, 2015).

For Binet, a pioneer in cognitive measurement, the intellectual capacity of human beings is so complex that it is necessary to take into account a wide variety of cognitive abilities and combine the scores to infer a person's level of intelligence (cited in Echavarri, Godoy and Olaz, 2007).

In research conducted with Argentine university students (Echavarri et al., 2007) it was found that men obtain better results in tests of verbal reasoning, abstract reasoning and calculation with respect to the results of women. In contrast, women stand out from men by gaining higher scores on tests of verbal fluency, spelling and language.

However, a study conducted with Chilean university students practically did not find significant differences according to sex when comparing school performance, reading comprehension, achievement in mathematics, scores on the University Selection Test (PSU), academic motivation, socio-emotional adaptation, social responsibility, social behavior and prosocial and antisocial behavior (Mathiesen et al., 2013).

Retaking García's contributions (2003):

> It should be noted that the differences in mental abilities linked to sex are also modular, and is not about defending general or global mental superiority of one sex over another, as has sometimes been tried by the IQ or similar measures .
>
> As a general trend, women outperform men in the tests of perceptual speed, when there is a need to quickly identify concordant objects. Also in tests of fluency in ideation, for example: enumerate objects that are of the same color; and in tests of verbal fluency, in which you have to find words that begin with the same letter. They behave more

successfully in precision manual tasks, which require fine motor coordination. They perform mathematical calculation tests better than men.

Men outperform women in certain spatial tasks, such as tasks that involve mentally spinning an object. They show greater precision than women in motor skills aimed at a target, such as throwing or intercepting projectiles. They perform better the identification tests of figures in complex frames, for example: find a certain figure or object hidden in a more complex figure. They also outperform women in mathematical reasoning tests (p.12).

Nastoyashchaya and López (2015) confirm, for their part, the following:

The existence of neuroanatomical and functional dimorphism between men and women is well documented. Studies on performance in working memory point to a male advantage in spatial and female working memory in verbal work memory (p. 35).

Objective

The main objective of the research is to determine the relationship between the physical dimension and the cognitive dimension in students of the third semester of the Degree in Physical Culture and Sports of the University of Sonora. This to favor the generation of strategies that allow improving their school performance.

The research will provide relevant information that will characterize the students of the third semester of the Degree in Physical Culture and Sports of the University of Sonora, offering information that will make it easier for teachers to select and develop teaching strategies according to the particular characteristics of this population.

In addition, the information generated may be considered for the formation of scales that describe the student's percentile results. No doubt study will allow to establish new hypotheses about the relationship of general intelligence and the practice of frequent physical exercise.

Method

The design of the research is non-experimental with a quantitative approach. The research is considered a case study for specifically collecting information from the students of the Degree in Physical Culture and Sports of the University of Sonora.

The two main dimensions of the study, cognitive and physical, were made up of the sum of the following indicators.

Cognitive dimension

a) Domino test.

b) Test of cognitive needs.

c) General average of semester 2018-1.

d) College Entrance Exam (Basic Knowledge and Skills Test) [Exhcoba]).

Physical dimension

a) Abdominal test in 30 seconds.

b) Horizontal jump test without impulse.

c) Manual dynamometry.

d) Test of lizards.

Participants

The study was carried out with 90 students of the third semester of the Degree in Physical Culture of the University of Sonora (64 men and 26 women). It should be specified that these are students who entered the 2017-2 semester. Each of them was asked in writing for informed consent to participate in the investigation. Likewise, it was corroborated through the consultation and medical review that all the participants will have a good state of health to present the tests without any risk.

Instruments

To describe the cognitive capacity, the following instruments were administered: Domino test of 48 reagents and the cognitive needs test. In addition, the 2016-1 semester average and the Exhcoba were considered. In this way, the four data were added to obtain the indicator of the cognitive dimension.

To describe physical fitness, a battery composed of the following tests was used: abdominals in 30 seconds, horizontal jump without impulse (recorded in centimeters), manual

dynamometry and lizards in one minute. The result of the sum of all these served as an indicator of the physical dimension.

Process

The tests were applied in the first and second week of classes of the August-December 2016 semester, following the instructions and the application protocol as it corresponds to each test.

The information was organized and analyzed using the IBM SPSS Statistics 21 program, with the intention of obtaining descriptive statistics and correlations between variables, using the Pearson correlation coefficient.

Results

The distribution by sex of the students participating in the study was as follows: 71% men and 29% women.

The overall average of all students in the educational program in the 2018-1 semester (semester prior to the study) was 76.37 (scale 0-100) and the average number of students participating in the study in the previous semester was 75, below the general average. However, the average is much lower than other careers at the same university, for example: medical students obtained an average of 90.24 in this same period. So it can be inferred that the Bachelor of Medicine is a career that requires a lot of dedication to study and leaves little time for physical activity, while the students of the Physical Culture and Sports race have semester with two or three sports subjects they require physical exercise with moderate intensity, so they perform more physical activity, but obtain lower averages in an academic program with the same regulatory requirement but less scientific content. The index of failed subjects in Physical Culture and Sport is 14 and in Medicine only 0.70 (obtained by dividing the failed subjects among the subjects studied during the semester 2018-1). As it can be observed, the amount of subjects rejected by the students is greater in Physical Culture and Sport. There is evidence, therefore, the discordance between physical exercise and school achievement.

The results of the cognitive tests are shown in table 1.

Tabla 1. Resultados de los indicadores de la dimensión cognitiva en hombres y mujeres

Prueba	**Hombres**		**Mujeres**	
	Promedio	Desviación Estándar	Promedio	Desviación estándar
Test de Dominó	28.56	5.56	27.84	5.09
Test de necesidades cognitivas	16.25	12.42	12.46	14.03
Promedio general del semestre 2016-1	84.25	6.24	87.34	3.19
Exhcoba	42.30	14.03	40.39	11.19
Dimensión cognitiva (sumatoria de los indicadores cognitivos empleados en el estudio)	171.37	23.77	168.04	20.52

Fuente: Elaboración propia

As can be seen in table 1, the only indicator that women outperformed men was in the general average of the 2018-1 semester.

In Table 2, on the other hand, the averages and standard deviations obtained by men and women in each physical test are presented.

Tabla 2. Resultados de los indicadores de la dimensión física en hombres y mujeres

Prueba	**Hombres**		**Mujeres**	
	Promedio	Desviación Estándar	Promedio	Desviación Estándar
Abdominales	23.46	5.06	19.69	5.31
Salto horizontal	189.81	33.04	148.69	19.90
Dinamometría	41.18	6.07	25.76	4
Lagartijas	42.87	18.07	31.15	11.99
Dimensión física (sumatoria de los test físicos, aplicados en el estudio)	297.34	45.78	225.30	31.01

Fuente: Elaboración propia

It is observed in table 2 that men outperform women in the physical tests applied in the study to obtain the indicator of the physical dimension.

The Pearson correlation coefficient of the two dimensions studied in the women was -0.09 (result not significant to confirm the correlation) and the result in men was 0.23 (result not significant to confirm the correlation), therefore, in Both sexes did not find any statistical relationship between the two dimensions studied. However, this does not mean that there is no interdependence between the two dimensions.

The criteria of statistical significance were the following:

a) When the calculated value is greater than that of the theoretical table, the null hypothesis was rejected with an error risk of 0.05. The correlation obtained does not come from a population characterized by a correlation of zero. It is confirmed, then, that both variables are related.

b) When the calculated value is less than that of the theoretical table, the null hypothesis with an error risk of 0.05 was accepted. The correlation obtained comes from a population characterized by a correlation of zero. It is confirmed, then, that both variables are not related.

The results of the crossing of variables and their relationship according to the Pearson correlation coefficient in the two dimensions studied are presented below (see table 3 and table 4).

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Tabla 3. Correlación de las variables correspondientes a la dimensión cognitiva, en hombres y mujeres

Correlación de variables de la dimensión Cognitiva	Hombres	Significatividad de las correlaciones de los hombres (p = 0.05)	Mujeres	Significatividad de las correlaciones de las mujeres (p = 0.05)
Test de Dominó y promedio general del semestre 2016-1	0.09	0.71 < 2.00 No hay diferencia significativa	-0.18	0.89 < 2.05 No hay diferencia significativa
Test de Dominó y test de necesidades cognitivas	-0.17	1.35 < 2.00 No hay diferencia significativa	0.42	2.26 < 2.05 *Existe diferencia significativa*
Test de Dominó y Exhcoba	0.39	3.33 < 2.00 *Existe diferencia significativa*	0.42	2.26 < 2.05 *Existe diferencia significativa*
Exhcoba y promedio general del semestre 2016-1	0.12	0.95 < 2.00 No hay diferencia significativa	0.13	0.64 < 2.05 No hay diferencia significativa
Exhcoba y test de necesidades cognitivas	0.22	0.96 < 2.00 No hay diferencia significativa	-0.03	0.14 < 2.05 No hay diferencia significativa
Test de necesidades cognitivas y promedio general del semestre 2016-1	-0.04	0.31 < 2.00 No hay diferencia significativa	-0.41	2.20 < 2.05 *Existe diferencia significativa*

Fuente: Elaboración propia

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Tabla 4. Correlación de las variables correspondientes a la dimensión física en hombres y mujeres

Correlación de variables de la dimensión física	Hombres	Significatividad de las correlaciones de los hombres (p = 0.05)	Mujeres	Significatividad de las correlaciones de las mujeres (p = 0.05)
Abdominales y salto horizontal	0.41	3.54 < 2.00 *Existe diferencia significativa*	0.79	6.31 < 2.05 *Existe diferencia significativa*
Abdominales y Lagartijas	0.45	3.96 < 2.00 *Existe diferencia significativa*	0.20	1 < 2.05 No hay diferencia significativa
Abdominales y dinamómetro	0.03	0.23 < 2.00 No hay diferencia significativa	0.34	1.77 < 2.05 No hay diferencia significativa
Salto horizontal y Lagartijas	0.23	1.86 < 2.00 No hay diferencia significativa	0.25	1.26 < 2.05 No hay diferencia significativa
Salto horizontal y dinamómetro	0.09	0.71 < 2.00 No hay diferencia significativa	0.44	2.40 < 2.05 *Existe diferencia significativa*
Lagartijas y dinamómetro	0.33	2.75 < 2.00 *Existe diferencia significativa*	-0.23	1.15 < 2.05 No hay diferencia significativa

Fuente: Elaboración propia

Discussion

In both sexes, a statistically significant positive relationship was found between the general intelligence variables obtained with the Domino test and the Exhcoba test, which is used as a filter to enter the university.

In women, a statistically significant positive relationship was found between the variables of the Domino test and the cognitive needs test, which measures the interest in developing activities that require deep thinking to analyze various situations. In addition, a negative relationship was identified between the results of the Cognitive Needs Test and the general average of the 2018-1 semester. Contradictorily, women with higher scores on the entrance examination said they did not have much desire to participate in activities that demand deep thinking. It should be considered that the rank of the score in women in the entrance examination in the period 2017-2 was 30-70 and in men it was 31-80. However, women achieve a higher average semester than men, so it can be attributed to their desire and dedication to obtain better qualification in the subject evaluations. It can be concluded that women are more dedicated to the fulfillment of the activities that are evaluated by the teachers, but they are not very interested in deepening in those that require a complex and deep thought.

Contrary to what was expected, no association or relationship was found between the grades obtained in the previous semester and the score obtained in the general intelligence test. This situation can be explained by obtaining their qualifications through the fulfillment of various activities and not only through the generation of evidence that demands an intellectual challenge.

In the physical dimension, the significant existence of positive correlation between abdominal variables and horizontal jump was identified in both sexes.

Only in men was a statistically significant positive correlation found in the abdominal and lizard variables, as well as in lizards and dynamometers. Although in women the positive correlation between horizontal jump and dynamometer was recorded, the association between variables is questionable.

It has been corroborated that the practice of frequent exercise is a factor that contributes to the improvement of health, and that impacts on various organs, systems and apparatuses of the human body. However, no relationship or association between cognitive ability and physical fitness was found. This means that obtaining a high score in a general intelligence test, such as the

Domino test, or having a high average in school performance, does not ensure a relationship with the development of physical fitness.

In this study, there was not enough evidence to support the findings presented by McElroy et al. (2016), which indicate that cognitive needs are lower in university students who perform more physical activity. Since there is no significant relationship between the cognitive and physical dimension, evaluated through self-administered selective tests, it is suggested to continue these studies by measuring both dimensions with specialized technological equipment.

People may have very little or very high cognitive ability and have very little or a lot of physical fitness. So it is not enough to be healthy or have developed body strength to be interested in learning the contents of educational programs at the undergraduate level or obtain a high score in the tests. Faced with this situation, we must recognize the cultural influence, the desire, interest and expectations of university students to devote more time to their studies. It confirms that physical exercise does not make you smarter or a good student. And that although genetics can endow the individual with intellectual or physical abilities, if they are not oriented towards study, learning or the development of physical fitness simply will not develop.

The heterogeneity of the population studied is highlighted with respect to their habits for physical exercise and the development of cognitive abilities. This is that the students of physical culture and sport present very dispersed indicators

Conclusions

Given the data obtained, it is confirmed that no conclusive evidence was found to relate physical fitness and cognitive ability, so there are not enough grounds to ensure that people with greater health or physical capacity are smarter or have more knowledge. It is recommended to take into account that learning will not occur if the person lacks interest and desire to learn, even if he / she has the potential to do so; If the information does not become knowledge and knowledge, it will not be part of the cognitive system of the person. Obviously if the person is ill, or because of the effects of mental deterioration generated by the loss of cognitive functions due to illness or senile state, the level of biopsychosocial balance may be lost, which affects the ability to attend and concentration in order to learn or incorporate new knowledge.

The fact that no statistical relationship has been found between some variables does not categorically deny the existence of an interdependence between both dimensions.

Both the physical dimension and the cognitive dimension must be stimulated in all stages of life. Having health is fundamental, but it is not enough to have a good state of health to develop physical or cognitive abilities. Physical exercise and a healthy lifestyle favors health in both men and women. And from this optimal state of equilibrium, each individual is responsible for what he does with his potential. Unfortunately, in the context of research, few students organize and manage their time to develop both capacities comprehensively.

Finally, it is concluded that the existence of a sexual dimorphism establishes marked differences between the sexes. And that is the appropriation of culture, the educability of the human being, which will drive a greater cognitive and physical development.

Since there is no significant relationship between the cognitive and physical dimension, evaluated through self-administered selective tests, it is suggested to continue these studies by measuring both dimensions with specialized technological equipment.

It is also suggested to conduct similar studies to offer greater knowledge about the mutual impact of physical exercise and cognitive development. When no compelling scientific evidence is presented, it is proposed to conduct qualitative studies that can describe and interpret the impact from the experiences of the subjects.

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