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Original article

The components of physical fitness, its relationship to health status in universities students

Los componentes de la condición física, su relación con el estado de salud en estudiantes universitarios

As componentes da aptidão física, a sua relação com o estado de saúde nos estudantes universitários

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ABSTRACT

This article aims to internalize the importance and benefits of the regular practice of physical activity. The objective of this work consisted in carrying out a study of the components of health-related physical fitness in students of the Bachelor's Degree in Socio-Cultural Studies of the University of Pinar del Río "Hermanos Saíz Montes de Oca". Nineteen first year students of this career were randomly selected. Theoretical and empirical research methods were used, such as document analysis and measurement. The values obtained, in terms of the percentage of fat, indicate that the risk factor of excessive fat accumulation can lead to the appearance of several chronic non-communicable diseases. In addition, it is evident that 73 % of the investigated sample presents deficiencies in the maximum aerobic power, that is, to supply the necessary oxygen to the muscles during a maximum physical effort. In general, the sample reaches an acceptable level that allows them to maintain an effort at medium or low intensity with sufficient oxygen supply. Therefore, it is necessary to strictly comply with a plan of actions aimed at modifying the body composition of the students under study.

Keywords: Pysical activity; Physical fitness; Health status; University students.

RESUMEN

El presente artículo pretende interiorizar la importancia y los beneficios de la práctica regular de actividad física. El objetivo de este trabajo consistió en realizar un estudio de los componentes de la condición física relacionada con la salud en los estudiantes de la carrera de Licenciatura en estudios Socio-Culturales de la Universidad de Pinar del Río "Hermanos Saíz Montes de Oca". Se seleccionaron aleatoriamente a 19 estudiantes de primer año de dicha carrera. Se utilizaron los métodos de investigación del nivel teórico y empírico como el análisis de documentos y la medición. Los valores obtenidos, en cuanto al porciento de grasa, indican que el factor de riesgo que conlleva la excesiva acumulación de grasas puede traer como consecuencia la aparición de varias enfermedades crónicas no transmisibles. Además, se evidencia que el 73 % de la muestra investigada presenta deficiencias en la potencia aeróbica máxima, o sea para suministrar el oxígeno necesario a los músculos durante un esfuerzo físico máximo. De manera general, la muestra alcanza un nivel aceptable que les permite mantener un esfuerzo a intensidad media o baja con suficiente aporte de oxígeno. Por ello es necesario el estricto cumplimiento de un plan de acciones que estén orientadas a la modificación de la composición corporal de los estudiantes objeto de estudio.

Palabras clave: Actividad física; Condición física; Estado de salud; Estudiantes universitarios.

RESUMO

Este artigo visa interiorizar a importância e os benefícios da prática regular da atividade física. O objetivo deste trabalho era realizar um estudo das componentes da condição física relacionadas com a saúde nos alunos do curso de licenciatura em Estudos Sócio-Culturais da Universidade de Pinar del Río "Hermanos Saíz Montes de Oca". Dezanove estudantes do primeiro ano desta carreira foram selecionados de forma aleatória. Foram utilizados métodos teóricos e empíricos de investigação, tais como análise e medição de documentos. Os valores obtidos em termos de percentagem de lípidos indicam que o factor de risco de acumulação excessiva de lípidos pode levar ao aparecimento de várias doenças crónicas não transmissíveis. Além disso, é evidente que 73% da amostra

investigada apresenta deficiências na potência aeróbica máxima, ou seja, para fornecer o oxigénio necessário aos músculos durante um esforço físico máximo. Em geral, a amostra atinge um nível aceitável que lhes permite manter um esforço a média ou baixa intensidade com suficiente fornecimento de oxigénio. Por conseguinte, é necessário o cumprimento rigoroso de um plano de ações orientadas para a modificação da composição corporal dos estudantes em estudo.

Palavras-chave: Atividade física; Aptidão física; Estado de saúde; Estudantes universitários.

INTRODUCTION

From the consultation of different sources of information on the relationship between physical fitness-activity, the authors of this paper confirm that regular and systematic physical activity has proven to be a highly beneficial practice in the prevention, development and rehabilitation of health. On the other hand, this practice is a means to forge character, discipline, decision making and compliance with rules, which benefit the development of the practitioner in all areas of daily life. Today, this vision has been accepted by many authors who state that the lack of physical activity in today's society has led to sedentary lifestyles being classified as one of the main public health problems of the 21st century.

The capacity to perform physical activity has been called physical fitness (Muros, 2016, p.2). This level of physical fitness, permeated by the values of the tests for weight, height and BMI, allows the determination of the needs of students, and thus, the teacher to guide their Physical Education sessions. This process aims to improve that which is most necessary for the class as a whole and results in the improvement of their state of health (Martínez, 2019, p.24).

Related to the topic addressed in the present work, i.e., physical fitness in university students and its relationship with health, several studies have been published in recent years. These reveal with data, the importance of physical sports activity and positive influence on health, among them those conducted by (Cardona *et al.,* 2017; Caro & Rebolledo, 2017; Chacón *et al.,* 2018; Vásquez *et al.,* 2018; Caro *et al.,* 2019).

In turn, in the review of research on the chronic effect of physical exercise on attention, based on physical-sports training, it was decided that future research is needed. These studies have been declared indispensable to clearly determine the type of physical exercise, the intensity and the necessary intervention time based on the improvement of attention, since some studies did not present benefits of this brain function (Cid, 2017, p.80).

To continue researching on the topic, the following premises are taken as a starting point: physical inactivity is considered a risk factor for the development of chronic noncommunicable diseases (cardiovascular disease, type 2 diabetes mellitus, metabolic syndrome and some types of cancer) and sedentary lifestyle is one of the risky behaviors with the highest prevalence today (Beltrán, *et al.,* 2012, p.3).

Guillamón (2019, p.9), in his study concludes that physical fitness is, perhaps, the most powerful predictor of future health status. Physical activity is the best strategy currently available; the following physical activity parameters for young (and even adult) subjects seem adequate to preserve health and improve quality of life. Although there is no

consensus on the relationship between physical activity and physical fitness in young subjects, the need for systematic physical activity for good health is undeniable, as individualization of practice is of great value.

The development of cardiorespiratory endurance in children, adolescents and young adults is associated with a decrease in the prevalence of cardiovascular diseases in children and adolescents. The *course navette test* or 20-meter run is a progressive maximal cardiorespiratory fitness test, which indirectly measures maximal oxygen consumption. High levels of aerobic capacity during childhood and adolescence are associated with healthier current and future cardiovascular health. Gómez (2014, p.11), en su estudio concluye que la clasificación del VO2 max, estimado en Course Navette para los estudiantes universitarios de educación física es aceptable, buena y excelente. Además, en la muestra de sujetos de ambos géneros la tendencia es que a menor frecuencia cardiaca mayor es el VO2 máx. y viceversa, cuando se determinó la relación entre ambos indicadores.

Caamaño (2016), in his study suggests the existence of a high prevalence of overweight, obesity and low levels of physical performance associated, being the cardiorespiratory capacity measured through the Cafra and Navette test; this presents a greater and significant association with excess malnutrition and cardio metabolic risk.

It is taken into consideration for future research to increase the number of students and incorporate new study variables to strengthen the present research.

Based on the previous evaluations, the objective of the present work was to carry out a study of the physical fitness components, related to health, in the first year students of the Bachelor's Degree in Socio-Cultural Studies, of the University of Pinar del Río "Hermanos Saíz Montes de Oca".

MATERIALS AND METHODS

The present research according to the purpose and the temporal and transversal scope was applied, since aspects of the development of subjects were taken in a single measurement; while the depth of the knowledge to be obtained was descriptive. According to the nature of the data, it was quantitative (observable aspects susceptible to quantification) and qualitative (oriented to the study of the meanings of human actions). According to the framework in which it takes place, it was field or fieldwork.

In order to fulfill the general objective of the present research, a random sample represented by 19 first year students of the Bachelor's Degree in Socio-Cultural Studies of the University of Pinar del Río "Hermanos Saíz Montes de Oca" was considered.

The methods selected to meet the objectives proposed in the research were those of the theoretical level (analytical-synthetic, inductive-deductive and historical-logical) and of the empirical level, measurement, which was used to determine body composition, the results of the different tests; in addition, the waist-hip index was analyzed.

The tests used were two total measurements (height and body weight), two circumferences (waist and hip), the Cafra test, the Navette test and the short abdominal test, planks, long jump without impulse running and flexibility.

Calculations for the determination of body mass index (Equation 1).

$$IMC=Peso\ (kg/Altura^2\ (m)\ (1)$$

Calculations for the determination of the waist-to-height ratio (Equation 2).

$$RCE=\ Perímetro\ de\ la\ cintura\ (cm)/Estatura\ (cm)\ (2)$$

Calculations for the determination of the waist-hip ratio (Equation 3).

$$ICC\ (cm)=\ Circunferencia\ de\ la\ cintura\ (cm)/Circunferencia\ de\ la\ cadera\ (cm)\ (3)$$

Aerobic endurance and cardiovascular performance (Cafra test)

This test allows estimating the oxygen consumption of an individual during aerobic work and his/her cardiovascular performance.

Maximum aerobic power (Navette test)

This test was used to evaluate maximal aerobic power, i.e., the body's capacity to supply the necessary oxygen to the muscles during physical exertion.

RESULTS

Table 1 shows the statistical results of the body mass index to determine whether a student is underweight, normal, overweight or obese. In general, it can be observed that 86% have a classification of normal, which indicates a correct fat metabolism (Table 1).

Table 1. - Results of the Body Mass Index analysis

Estudiantes	Edad	Sexo	Peso (kg)	Altura (m)	IMC	Clasificación
1	20	M	65.4	1.76	20.98	Normal
2	19	F	51.2	1.62	19.46	Normal
3	18	F	58	1.60	22.65	Normal
4	17	F	58.8	1.64	21.64	Normal
5	17	F	47.6	1.57	19.10	Normal
6	18	F	54.4	1.58	21.68	Normal
7	19	M	50	1.70	17.30	Bajo peso
8	18	F	50.2	1.64	18.65	Normal
9	17	M	80.6	1.82	24.16	Normal
10	18	F	48.8	1.59	19.04	Normal
11	18	F	40.2	1.57	16.26	Bajo peso
12	18	F	59.4	1.57	23.98	Normal
13	18	M	68	1.76	22	Normal
14	19	M	62	1.73	20.73	Normal
15	17	F	62	1.57	25.20	Sobrepeso

Table 2 shows the results, according to the waist-to-height ratio, where it can be seen that no student presents a risk of developing cardio metabolic diseases in adulthood (Table 2).

Table 2. Results of the waist-to-height ratio

Estudiantes	Cintura(cm)	Estatura(cm)	RCE
1	69	176	0.39
2	64	162	0.39
3	64	160	0.40
4	68	164	0.41
5	57.5	157	0.36
6	61	158	0.38
7	68	170	0.40
8	62	164	0.37
9	84	182	0.46
10	61	159	0.38
11	53.5	157	0.34
12	65	157	0.41
13	69.5	176	0.39
14	67	173	0.38
15	63.5	157	0.40

Table 3 shows a predictive indicator for health, where it is evident that 100 % of the students of Socio-Cultural Studies do not have risk levels. Therefore, work should continue with these students from the dietary point of view, such as the adoption of work regimens that favor the decrease of fat body weight and increase, with an inversely proportional relationship, the muscle weight (Table 3).

Table 3. - Waist-hip ratio index results

Estudiantes	Sexo	Cintura(cm)	Cadera(cm)	Tipo de distribución	Riesgo para la salud
1	M	69	87	Inferior	Bajo
2	F	64	88.5	Inferior	Bajo
3	F	64	93	Inferior	Bajo
4	F	68	92	Inferior	Bajo
5	F	57.5	84.5	Inferior	Bajo
6	F	61	89	Inferior	Bajo
7	M	68	82	Inferior	Bajo
8	F	62	88	Inferior	Bajo
9	M	84	97	Inferior	Bajo
10	F	61	86	Inferior	Bajo
11	F	53.5	79	Inferior	Bajo
12	F	65	94	Inferior	Bajo
13	M	69.5	90	Inferior	Bajo
14	M	67	86	Inferior	Bajo
15	F	63.5	88.5	Inferior	Bajo

The risk factor associated with excessive fat accumulation can lead to the appearance of several chronic non-communicable diseases such as obesity, diabetes mellitus, arterial hypertension and acute myocardial infarction, among others.

On the other hand, Figure 1 shows the results of the application of the Cafra test, where it is observed that 62.5 % of the sample reached an acceptable level. This allows them to maintain an effort at medium or low intensity with sufficient oxygen supply. The 37.5 % of the sample obtained a pulse ≥ 160, so they could not perform the Navette test (Figure 1).

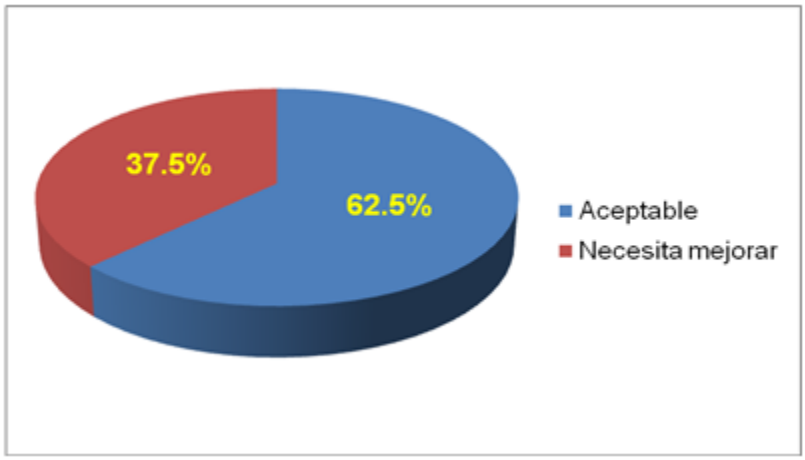

Fig. 1. - Cafra test results

The Navette test could only be performed by 15 students, since the rest of the sample had a pulse rate ≥ 160. It can be seen that 73 % of the sample investigated shows a deficiency in maximum aerobic power, that is, to supply the necessary oxygen to the muscles during maximum physical exertion (Figure 2).

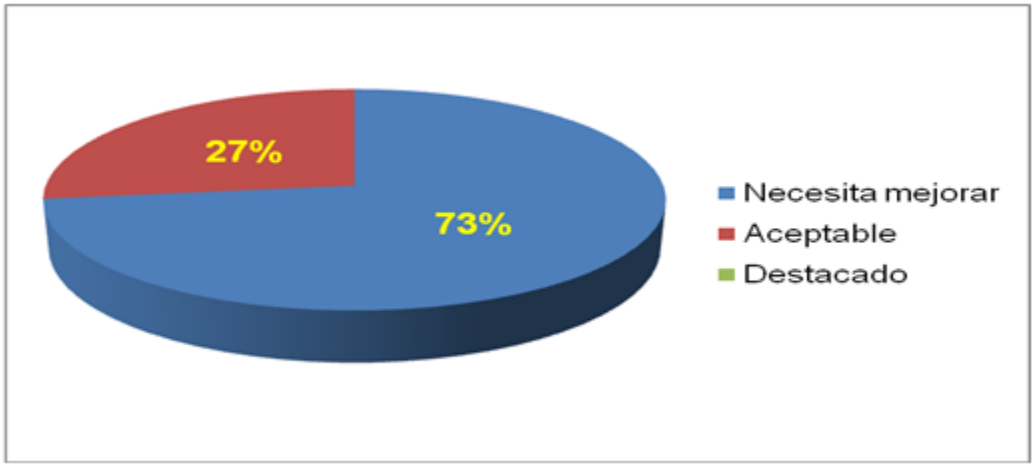

Fig. 2. - Navette test results

DISCUSSION

Weight and BMI (body mass index) may also sometimes be considered as confounders and relative risk estimates or other measures of association adjusted for them. Similarly, it will be more appropriate to use BMI as a continuous quantitative variable (and not dichotomize it, for example, into obesity: yes/no) when adjusting to limit residual confounding.

As in most of the studies published to date, women had a greater tendency to underestimate their true weight, although in this case this was not significant. Similarly, people with higher weight values and/or lower height values were the ones who contributed the most inaccuracy in the self-reported values. This may be due to a social desirability bias.

The mean relative weight error is slightly lower in absolute terms than that found in other studies; this may be due to the fact that the SUN participants are volunteers motivated by a sense of altruism (participation is not remunerated or incentivized) and many of them are health professionals who, in addition to having a better knowledge of health variables, are probably more aware of the importance of the accuracy of their self-reported data.

In relation to the physical performance of these students, the levels of overweight, obesity and cardio metabolic risk, alterations were found in the physical performance of the students.

Young people with overweight or obesity (6.6 %) showed a significant increase in anthropometric measurements, as well as a decrease in all variables that determine physical performance. Studies in Chile have shown that obese schoolchildren have a higher waist circumference, need more time to run 400 meters and have increased levels of basal glucose (30), it has been described in American schoolchildren, that a healthy BMI is associated with better levels of physical fitness.

Campos *et al.,* (2016) concluded in their study that schoolchildren with obesity presented a decrease in all the variables that determined physical performance and it was the cardiorespiratory capacity alteration measured through the Cafra and Navette tests that presented the greatest and significant association with overweight, obesity and cardio metabolic risk.

In the present investigation, students with obesity presented a greater and significant waist circumference compared to groups with normal weight; in a study carried out in young people, cardiorespiratory fitness was inversely associated with abdominal adiposity measured through waist circumference (25.20). In this study, there were no significant differences in the comparison by sex in cardiorespiratory fitness measured by the Navette test.

It is important to consider that the positive impact of physical exercise on the reduction of body fat, metabolic syndrome and cardiovascular risk factors in students has been demonstrated. In addition, people with high body weight and good cardiorespiratory capacity have a lower mortality risk than people of normal weight with poor capacity, which should be considered for prevention and treatment strategies for this condition in young people.

In adults, physical activity is associated with a lower risk of obesity, cardiovascular disease, hypertension, diabetes, cancer, and premature mortality. There is sufficient evidence that the origins of cardiovascular disease lie in childhood and adolescence. The relative lipid and lipoprotein numbers, blood pressure, and adiposity of young people tend to persist throughout life (tracking). There is also evidence that patterns of physical activity behavior in childhood persist into adulthood. If, in addition to all this, we take into account the difficulty of modifying habits in adult life, we can safely say that adolescence and youth are key stages in the primary prevention of cardiovascular disease and other diseases associated with sedentary lifestyles.

Although it is commonly assumed that more active young people have better physical fitness and that this relationship is causal, it is thought that this assumption cannot be maintained in the light of current knowledge. The proportion of variation in different measures of physical fitness attributable to physical activity is small in children and adolescents; moreover, measures of physical activity and physical fitness show great variability. To unpack the relationships between these concepts, it is perhaps best to begin by defining them.

The terms physical activity, physical exercise and physical fitness are often used in a confusing way; however, although they are closely related variables, they should not be used synonymously. Physical activity refers to any bodily movement produced by skeletal muscle that requires energy consumption, and physical exercise is defined as planned, structured, systematic physical activity aimed at improving or maintaining one or more components of physical fitness. Physical fitness can be considered as a measure of the capacity to perform physical activity and/or physical exercise that integrates most of the body functions (locomotor, cardiorespiratory, hematocirculatory, endocrinometabolic and psychoneurological) involved in body movement. Physical fitness has historically been conceptualized in three components: cardiorespiratory capacity (CRC), strength and motor skill. Over time, this concept has evolved from being directed primarily at the components of strength and motor skills to focus on components more directly related to health, and is referred to as health-related physical fitness. Although the specific tests for determining health-related physical fitness are somewhat heterogeneous, health-related physical fitness includes cardiorespiratory capacity, muscular strength and endurance, flexibility and body composition (especially adiposity), and in children, speed and agility as well.

Although much of the variability in physical fitness is genetically determined, environmental determinants and especially physical exercise influence physical fitness. In children, the relationship between physical activity and physical fitness is less robust. It has been argued that, in younger children and adolescents, because physical activity occurs unpredictably, unsystematically, and over periods of short duration, it may not modify physical fitness. Furthermore, the lack of concordance in the findings of the different studies assessing the relationship between physical activity and physical fitness in children and adolescents could be due to the multitude of methods that have been used to measure both physical fitness and physical activity. An important aspect when trying to assess the effects of daily physical activity is the difficulty of obtaining valid and accurate measurements.

In agreement with Escalante (2011), closely linked to the field of physical activity and health is physical exercise, which is defined as "planned, structured and repeated physical activity aimed at acquiring, maintaining or improving physical fitness". Thus, a physical exercise program requires planning and structuring the intensity, volume and

type of physical activity to be performed. On the other hand, health-related physical fitness was defined in the Toronto Model of Physical Fitness, Physical Activity and Health as "a dynamic state of energy and vitality that enables people to carry out the usual tasks of daily life, enjoy active leisure time and cope with possible unforeseen emergencies without excessive fatigue, while helping to avoid hypokinetic diseases and to develop maximum intellectual capacity by fully experiencing the joy of living." The practice of physical activity influences the improvement of health-related physical fitness, and to a greater extent physical exercise does. However, some works reflect the relevance of having optimal levels of health-related physical fitness versus the regular practice of physical activity in isolation. In this regard, the practice of physical exercise programs seems to be the optimal way to improve health-related physical fitness. However, sometimes the programs that reach the public are far from having the required planning and structuring, or are not based on clear scientific support. For example, there are few studies on physical exercise programs as fashionable as Pilates. Thus, it seems necessary for the Public Health field to promote the practice of well-planned physical exercise programs that allow an improvement in physical fitness related to health.

CONCLUSSIONS

By way of conclusion, a group of tests are applied, which allow evaluating the physical fitness of the students in the functional aspect, where the results are quantitatively demonstrated. The values obtained in terms of the percentage of fat indicate that the risk factor involved in the excessive accumulation of fat can result in the appearance of several chronic Noncommunicable diseases. Therefore, it is necessary to strictly comply with a plan of actions aimed at modifying the body composition of the students under study.

At the same time, teachers should be provided with the results of their students in order to establish comparisons with subsequent tests.

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The authors declare not to have any interest conflicts.

Authors' contribution:
Jesús Costa Acosta: Conception of the idea, literature search and review, instrument making, instrument application, compilation of information resulting from the instruments applied, statistic analysis, preparation of tables, graphs and images, database preparation, general advice on the topic addressed, drafting of the original (first version), review and final version of the article, article correction, authorship coordinator, translation of terms or information obtained, review of the application of the applied bibliographic standard.

Manuel Rafael Valdés López Portilla: Conception of the idea, literature search and review, instrument making, instrument application, compilation of information resulting from the instruments applied, statistic analysis, preparation of tables, graphs and images, database preparation, general advice on the topic addressed, drafting of the original (first version), review and final version of the article, article correction, authorship coordinator, translation of terms or information obtained, review of the application of the applied bibliographic standard**.**

Alexis Rodríguez Madera: Conception of the idea, literature search and review, instrument making, instrument application, compilation of information resulting from the instruments applied, statistic analysis, preparation of tables, graphs and images, database preparation, general advice on the topic addressed, drafting of the original (first version), review and final version of the article, article correction, authorship coordinator, translation of terms or information obtained, review of the application of the applied bibliographic standard**.**

Annette Núñez González: Conception of the idea, literature search and review, instrument making, instrument application, compilation of information resulting from the instruments applied, statistic analysis, preparation of tables, graphs and images, database preparation, general advice on the topic addressed, drafting of the original (first version), review and final version of the article, article correction, authorship coordinator, translation of terms or information obtained, review of the application of the applied bibliographic standard**.**