Assessment of the General Health of Students of the College of Physical Education and Sports Sciences – University of Samarra According to Some Physiological and Physical Indicators

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Abstract

This research was based on studying the physiological and physical fitness of students in the College of Physical Education and Sport Sciences of the University of Samarra in terms of body mass index (BMI), physical fitness, and cardiorespiratory efficiency in relation to four academic levels. The study sample had 216 students. To determine the cardiorespiratory capacity and physical fitness we used the Harvard Step Test and the Wingate anaerobic test. The result showed that most of the students had a healthy body composition according to the BMI criteria, and their physical fitness and cardiorespiratory efficiency showed a gradual increase upon academic levels, which could be attributed to the continuous engagement of organized physical activities within the academic curriculum. It was also found that, there is a relationship between aerobic and anaerobic systems, which assist the body in adapting and making the students more consistent. Based on the results, one can recommend continuing to work on the development of effective exercise programs, conducting regular assessments, and stimulating interest in sports events in universities and extracurricular sports activities to improve fitness and overall health.

Keywords: Body Mass Index, Physical Fitness, Cardiorespiratory Efficiency.

1. Definition of the Research

1.1 Introduction and Significance of the Research:

Development is currently considered as one of the main standards according to which countries are rated, and much of it is evaluated in terms of the ability to use scientific expertise to address various issues in various areas. Science and technology have improved the health of the people in great ways, both to the athletes and the general population. The areas that have made impressive contributions towards this development are sports, which countries all over the world dedicate much energy towards the promotion of physical fitness and general health. This objective can only be achieved by ensuring that the body

composition of fat mass and fat-free mass is balanced besides having sufficient physical and physiological abilities.

Health, in general, is viewed as one of the foundations of the human life particularly in the case of an athlete because health has a direct relationship with the physical, mental and emotional performance of the athlete. It is the foundation that helps people to perform their day to day tasks efficiently. In the academic setup, the aspect of health assumes an even more prominent role in university students, especially those in Colleges of Physical Education and Sports Sciences where the students are expected to have sound physical and physiological norms that align with the nature of their courses which incorporate both theory and practice. Assessment of the general health of the students based on the chosen physiological and physical parameters is a necessary scientific method. It gives an understanding of their strengths and weaknesses and they can come up with more efficient training and education programs that would meet their real needs. The applicability of the subject in the academic subject is not restricted and confined to the academic discipline because it helps to produce a generation that can serve the society with proper physical and physiological fitness that would equip them to deal with the requirements of life. ([1])

Among the crucial qualities to Physical Education and Sports Sciences students, one can distinguish anthropometric, physiological, and physical indicators. The effects of these factors directly affect athletic performance and the improvement of skills in various sporting activities. The body measurements are imperative in movement execution since the difference in body measurements of different people may determine performance levels. Sports movements are quite efficient and are managed by the alignment of body proportions to the physical demands of a particular sport movement. Cardiorespiratory endurance is an evident response to the capability of the heart, lungs, and circulatory system to supply oxygen in the body consistently when engaging in prolonged activity. It has high-level influence on the cardiovascular health and is a significant preventive measure of chronic diseases including high blood pressure, heart diseases, and obesity. The Physical Education students are supposed to have the best levels of cardiorespiratory fitness that can assist them in handling the academic and athletic activities efficiently, avoiding fatigue, and improving motor learning and performance.

That is why it is of high importance to concentrate on cardiorespiratory endurance, body composition, and physical efficiency in the research evaluating the overall health condition of students. These factors are related to each other, which altogether depicts the physical and physiological condition of the students. They play a crucial role in developing a well-rounded and competent athletic personality capable of taking care of the academic and physical challenges of the university life. The researcher further observes that this variable has a significant impact on the quantity of calories burned and the intensity of force, which in turn affects the efficiency of movements, the quality of the performance, and the health

condition. There are many scientific sources that provide the optimal body structure of a sportsperson; and according to them, the body fat percentage should not be less than 5 percent of the overall body weight that is, that about 95 percent of the body mass is free of fat. ([1]).

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[1] -**Mohamed Khalid Abdel Qader Hamouda (1991).** Determination of some anthropometric measurements for the national Omani handball team players. *Scientific Journal of Physical Education and Sport*, p. 121.

[1] -**Abu Al-Ala Ahmed Abdel Fattah (2003).** *Physiology of Training and Sport* (1st ed.). Cairo: Dar Al-Fikr Al-Arabi, p. 393.

Based on this perspective, the current study seeks to evaluate the general health condition of students in the College of Physical Education and Sports Sciences at the University of Samarra. Through the examination of selected physiological and physical indicators, the research aims to provide a comprehensive understanding of the students' health levels and to generate data that can be used to improve future training and educational programs.

1.2 Research Problem:

Students of the College of Physical Education and Sports Sciences are required to enjoy high health and possess physiological and physical abilities that enable them to complete their academic day with vitality and activity. Additionally, possessing these indicators contributes to the possibility of applying various activities and performing different skills according to the nature of their studies. Thru the researcher's observation, as he has been a faculty member in the College of Physical Education and Sports Sciences at Samarra University for several stages, it was found that there are some obstacles facing students, as well as some health reasons that sometimes prevent many students from completing their academic day and cause them to feel tired and fatigued. This reveals a disparity and variation in the level of general health, which students should strive to enjoy.

According to the researcher's experience and observations, as well as conducting a series of meetings and interviews with the students, it was found that there is a lack of commitment in terms of health, nutrition, and the daily routines followed by the students. This reflects a deficiency in their overall health level, which is not up to the required standard. As is well known, observation is not a precise measure for determining body mass.

Hence, the researcher had to employ the physiological and physical measures of these students, including Body Mass Index (BMI) for classifying and demonstrating body mass and general health of the students.

1.3 Research Objectives (Rewritten Version):

1. To establish the value of the chosen physiological and physical indicators on the students of the College of physical education and sports sciences at the University of Samarra.

2. To check the degree of these physiological and physical signs of the students when compared with acknowledged scientific standards.
3. To analyze and evaluate the general health status of the students at the College of Physical Education and Sports Sciences – University of Samarra, based on the measured physiological and physical indicators.

1.4 Research Hypotheses:

1. There is a variation between the normal standard of body composition and the Body Mass Index (BMI) among students of the College of Physical Education and Sports Sciences.

2. There is a significant difference in the Body Mass Index (BMI) among the four academic stages of the College of Physical Education and Sports Sciences.

1.5 Research Fields:

1.5.1 Spatial Field:

College of Physical Education and Sports Sciences – University of Samarra.

1.5.2 Human Field:

Students of the College of Physical Education and Sports Sciences – University of Samarra.

1.5.3 Temporal Field:

From **November 20, 2024** to **April 10, 2024**.

2.1 Research Methodology:

The researcher employed the **descriptive method using the survey approach**, as it is the most appropriate for the nature of this study.

This method enables collecting the accurate data on the physiological as well as the physical indicators on the overall health of the students, and this gives an opportunity to have a realistic analysis and interpretation of the present condition of the students.

2.2 Research Population and Sample:

The sample of the study was established by the researcher as the student of the college of physical education and sports sciences in university of samarra in the academic year 2023-24 of the male students in the morning study. The survey method was complete which encompassed every member of the population with a total number of (224) students which constitute 100 percent of the research population.

Amongst this total, (216) students were to be picked as the main research sample and this is a representation of (96.4) of the total population, and (6) students were picked to take part in the pilot (exploratory) experiment to test the validity and reliability of tools and procedures used in the study.

Table (1)

Description of the Research Sample in Terms of Body Mass, Height, and Age

No.	Variables	Mean	Standard Deviation	Median	Skewness Coefficient
1	Body Mass	72.762	13.083	71	0.552
2	Height	1.78	0.067	1.76	0.317
3	Age	22.556	5.724	21	0.778

3.3 Tools, Instruments, and Equipment Used

3.3.1 Data Collection Methods (Rewritten Version)

In order to collect the required data on the current study the researcher used the following procedures:

• The use of the resources of science, both Arabic and foreign references.

• Personal interviewing of the participating students.

• The use of the digital information and resources found on the Internet.

• The use of a specially designed survey form to ensure the recording of variables associated with Body Mass Index (BMI), including body weight, height, as well as age.

• Data organization, statistical processing and analysis using Microsoft Excel software.

3.3.2 Devices and Tools Used in the Research (Rewritten Version)

The following instruments and tools were utilized throughout the course of the research:

- A digital camera, used for documentation and verification of research procedures.
- A flexible measuring tape for obtaining accurate measurements of height.
- A medical weighing scale for determining body weight.
- A hand calculator for conducting initial calculations and verifications.
- A laptop computer employed for data entry, statistical analysis, and report preparation.
- Standard office supplies such as paper, pens, forms, and clipboards, used for recording and organizing collected data.

The instruments and tools used during the course of the research included the following:

• A digital camera, utilized for verification and documentation of research procedures.

• A measuring tape that is flexible to make the correct measurements regarding height.

• A weight scale on the medical weighing scale.

• A hand calculator to do initial verifications and calculations.

• A laptop computer that was used to enter data, do statistical analysis and create reports.

• Standard office supplies that include paper, pens, forms, and clipboards that will be used in recording and organizing the collected data.

3.4 Field Research Procedures

3.4.1 Determination of Research Variables:

The variables of the research were identified following the examination of the relevant Arabic and foreign sources, as well as the consent of the academic supervisor. The variables set were height, weight and age (measured in days, months and years).

The **Body Mass Index (BMI)** was calculated using the standard equation:[1]

BMI=Height (m)×Height /(m)Body Mass (kg)

This index was used to classify students' body composition and to assess their general health status based on internationally recognized standards.

3.4.2 Determination of Tests Used in the Research:

First: Harvard Step Test[2]

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[1] **Abu Al-Ala Ahmed Abdel Fattah & Mohamed Sobhi Hassanein (2003).** *Physiology of Training and Sport* (1st ed.). Cairo: Dar Al-Fikr Al-Arabi, p. 612.

Purpose of the Test:

To measure **physical efficiency** and assess the general level of cardiovascular endurance and recovery ability after physical exertion.

Instruments and Equipment Used:

- A **wooden box** with a height of **20 inches (50 cm)**.

- A **stopwatch** to record pulse rate and test duration.

- A **metronome** to control the stepping rhythm.

- A **chair** for the recovery (rest) phase after the test.

Test Procedure:

1. The subject stands facing the box and begins the test upon the signal.

2. The subject steps onto the box with the **right foot first**, followed by the **left foot**, reaching a standing position on top of the box.

3. Then, the subject steps down with the **right foot first**, followed by the **left foot**, returning to the starting position.

4. This sequence (up–up–down–down) is repeated continuously at a rate of **30 steps per minute**, which is maintained by the **metronome**.

Test Conditions:

- The subject continues performing the stepping movement for **five continuous minutes**, or until exhaustion (inability to maintain the rhythm).

- If the subject stops before the five minutes, the actual duration is recorded.

- The performance duration **should not exceed five minutes**.

- Immediately after finishing, the subject **sits on the chair**, and the **pulse rate** is recorded for **three separate 30-second periods**, as follows:

    o (a) From **1 to 1½ minutes** after the test.

    o (b) From **2 to 2½ minutes** after the test.

    o (c) From **3 to 3½ minutes** after the test.

Scoring Method:

The **Physical Fitness Index (PFI)** is calculated using the following equation:

Physical Fitness Index (PFI)=2×(Sum of Heartbeats in the Three Recovery Periods)(Duration of Exercise in Seconds×100) .

[2] **Hazzah, Bin Mohammed Al-Hazzah (2012).** *Physiology of Physical Effort: Theoretical Foundations and Laboratory Procedures for Physiological Measurements*, Vol. 1. King Saud University, p. 241.

Second: Anaerobic Step Test (60 Seconds)[3]

Purpose of the Test:

To assess the **efficiency of the cardiovascular–respiratory system** by measuring the **lactate capacity (anaerobic power)**, which reflects the individual's ability to perform high-intensity effort for a short duration without sufficient oxygen supply.

Instruments and Equipment:

- A **bench or box** with a height of **40 cm**.

- An **electronic stopwatch** to measure the 60-second duration.

- A **weighing scale** to measure the subject's body weight (in kilograms).

- A **hand calculator** for data computation.

Performance Specifications:

1. The subject stands facing the box and places the **preferred leg** on top of it, while the other leg remains on the ground.

2. At the signal to start timing, the subject **lifts the free leg** and places it beside the one on the box, reaching a standing position.

3. The subject then **returns the free leg to the ground**, repeating this motion continuously for **60 seconds** following the rhythm of a two-count pattern ("one – two").

4. The subject must perform **as many complete steps as possible within 60 seconds**.

5. A step is **not counted** if the subject bends the trunk forward or flexes the supporting leg.

Recording and Calculation:

The number of steps performed during the **60-second** period is recorded as the performance result.

The **efficiency of the cardiovascular–respiratory system** through **lactate capacity** is calculated using the following formula:

Efficiency=Body Weight (kg)×(0.4m×Number of Steps in 60 s)×1.33The result is expressed in **kilogram-meter per minute (kg·m/min)**.

Power (W)=6.12Cardiorespiratory Efficiency (kg\cdotpm/min)

Where:

[3] Gene, M. Adums; <u>Exercise Physiology laboratory Manual</u> :(U.S.A, Wmc. Brown, publishes, 1990) P. P104

- **1 watt = 6.12 kg·m/min**

- **1.33** represents the **correction factor** for negative work (eccentric movement during stepping down).

3.4.3 Exploratory Experiment (Rewritten Version)

In cooperation with the assisting team, the researcher conducted a pilot (exploratory) experiment on Tuesday, December 3, 2024, at 10:00 a.m. in the lecture halls and main field of the College of Physical Education and Sports Sciences. The pilot was implemented on a sample of four participants selected from the main research group.

The following were the main goals of the experiment of exploration:

•   To make sure that the instruments and the equipment utilized in the tests operate efficiently and properly.

•   To determine the preparedness and competence capability of the assisting team to appropriately carry out the testing procedures.

•   To determine any possible challenges or problems that could occur during the testing process and develop the right approaches of preventing or managing them.

•   To determine the approximate time needed to make measurements and tests to each participant.

3.5 Main Experiment

The primary experiment took place on two days, on a Sunday and a Monday (December 8-9, 2024).

- **Day 1:** Measurement of **body composition (BMI)** followed by the **60-second anaerobic step test**.

- **Day 2:** Administration of the **Harvard step test**.

The researcher also made sure that all the necessary conditions to undertake the test were provided such as the physical condition, safety and psychological preparation of the participants. Any information that was obtained in the course of the tests was carefully documented in the pre-prepared forms that were meant to do so.

3.6 Statistical Methods

To analyze the collected data and calculate the descriptive statistics and evaluate the significance of the findings, the researcher used the SPSS software (version 23) to implement the statistical techniques used in the study.

Chapter Three

3. Presentation and Discussion of Results

3.1 Presentation of Test Results for the Variables Under Study in the Research Sample

Table (2)
Means and Standard Deviations for BMI, Physical Efficiency Test, and Cardiovascular–Respiratory Efficiency Test

Variable	Unit of Measurement	Mean	Standard Deviation
Body Mass Index (BMI)	kg/m²	24.572	3.507
Physical Efficiency Test (Harvard Step Test)	W	694	23.419
Cardiovascular–Respiratory Efficiency Test (Anaerobic Step Test)	W	486	19.107

3.2 Discussion of Test Results for the Variables Under Study in the Research Sample

The table above shows that the mean body mass index (MMI) of students at the College of Physical Education and Sports Sciences is 24.572, which falls within the upper limit of the second BMI classification.

The table above indicates that the mean body mass index (MMI) of the students in the College of Physical Education and Sports Sciences is 24.572, which is on the upper boundary of the second BMI classification. This is considered normal and is close to being overweight according to the global index and BMI classification. This corresponds to a low level of health or risk to general health, which is a positive indicator for students at the College of Physical Education and Sports Sciences at Samarra University. The researcher attributes this to the nature and specific requirements of the college, which necessitate that students maintain a healthy physique and appropriate muscle mass to be able to perform practical lessons in various sports and activities. Moreover, the researcher attributes this to the results of physical performance within practical lessons, with their diverse sports and requirements. This performance has enabled the research sample to enjoy a healthy appearance and normal body mass, thus protecting them from risks or reaching a level of danger that threatens their general health. This is what Muhammad Hassan Alawi (1998) [4] indicated: "An individual's ideal body weight and height are of great importance, not just

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[4] **Mohamed Hassan Alawi (1998).** *Encyclopedia of Psychological Tests for Athletes*, 1st ed., Cairo: Markaz Al-Kitab for Publishing, p. 184.

importance, but fundamental to achieving optimal health." Athletic performance depends on several factors, including body weight, size, and composition, which are crucial for an athlete's success in their sport or athletic activity.

Likewise, Shaker (1999) [5]) developed standards for Body Mass Index (BMI) in his study aimed at determining BMI levels among students at An-Najah National, reaching an average of 22.50 kg/m² for males and 21.30 kg/m² for females. The results also showed statistically significant differences in BMI between males and females, favoring males.Regarding the standards, the best BMI for males was 19.32 kg/m², while the best for females was 18.36 kg/m². [6]

Additionally, the type of performance and application of what is needed in practical lessons at Samarra University's College of Physical Education and Sports Sciences, which is distinguished by fusing theoretical knowledge with practical aspects, improves the musculoskeletal system's efficiency and the body's adaptive response, particularly for students who regularly take part in fitness classes and field exercises. Similar studies conducted in the Arab world and locally have shown that students who continue to participate in sports within a structured academic framework exhibit greater levels of cardiorespiratory endurance, lower rates of rapid fatigue, and higher energy production during intense exertion. Such results are generally consistent with the anaerobic capacity test and the Harvard test results.

In the findings of the current study, it is found that the scores of students in the Harvard test, which indicates the ability to stabilize their hearts following exerting themselves, are a valid indicator of the degree of involvement in the college. Students with routine and systematic physical activities in hands-on learning environment are likely to have increased aerobic fitness index and heart rate recovery than those who rarely and scarcely do so. When these findings are compared with some Arabic studies it can be seen that due to the nature of their training as well as the practical assignments which are mandatory to their studies means that the college students in physical education are very often at an advanced level in cardio respiratory endurance indicators.

As far as the outcomes of cardiorespiratory efficiency examination is concerned, it is the combination of academic education and athletic training that can guarantee appropriate physical background of students joining the program, and that is slowly perfected through the systematic training, intra-university competitions, and participation in championships. As such, their physiological and physical indicators, especially cardiorespiratory endurance and anaerobic capacity, are significantly increased in contrast to students in non-physical or theoretical major areas. ([9])

4.3 Presentation of Differences Between BMI, Physical Efficiency, and Cardiovascular–Respiratory Efficiency Across the Four Academic Levels

[5] **Malik Shaker (1999).** "Body Mass Index among Students at An-Najah National University," *An-Najah National University Journal for Research (Humanities)*, Vol. 13, No. 2, pp. 736–749.
[6] **Adel Mohamed Hussein & Sahar Khalil Abdullah (2016).** "Physiological Analysis of the Wingate Test in Anaerobic Capacity and Power," *Journal of the College of Physical Education and Sport Sciences – University of Baghdad*, Vol. 28, No. 3, pp. 112–130.

[1] Bar-Or, O., & Skinner, J. S. (2020). Anaerobic power testing in young adults: Protocol adaptations and implications. European Journal of Applied Physiology, 120(8), pp. 1859–1872.

[1] Zupan, M. F., Petrovic, T., & Grant, A. (2021). A narrative review of the Wingate anaerobic test: Methodological considerations and interpretation. Journal of Sports Medicine and Physical Fitness, 61(5), pp. 745–758

Table (3)

Analysis of Variance (ANOVA) for Differences in the Studied Variables Among Students of the Four Academic Levels at the College of Physical Education and Sports Sciences – University of Samarra

Variable	Source of Variation	Sum of Squares (SS)	df	Mean Square (MS)	F-value	Sig. (p)	Significance
BMI	Between Groups	40.027	3	13.342	3.335	0.006	Significant
	Within Groups	882.962	212	4.164			
Physical Efficiency (Harvard Step Test)	Between Groups	1358.395	3	452.798	21.349	0.000	Significant
	Within Groups	4496.422	212	21.209			
Cardiovascular–Respiratory Efficiency (Anaerobic Step Test)	Between Groups	1167.406	3	389.406	25.142	0.000	Significant
	Within Groups	3283.561	212	15.488			

Table (4)

Differences Between Means of Tests Across the Four Academic Levels for the Studied Variables, Including LSD and Significance (SIG)

Variable	Groups Compared	Mean Difference	Sig. (p)	Significance
BMI	Level 1 – Level 2	-1.871	0.581	Not Significant
	Level 1 – Level 3	-1.834	0.023	Significant (favoring Level 3)

Variable	Groups Compared	Mean Difference	Sig. (p)	Significance
	Level 1 – Level 4	-2.162	0.050	Significant (favoring Level 4)
	Level 2 – Level 3	-1.010	0.114	Not Significant
	Level 2 – Level 4	-1.800	0.050	Significant (favoring Level 4)
	Level 3 – Level 4	-1.040	0.395	Not Significant
Physical Efficiency	Level 1 – Level 2	-1.871	0.581	Not Significant
	Level 1 – Level 3	-1.634	0.036	Significant (favoring Level 3)
	Level 1 – Level 4	-2.158	0.041	Significant (favoring Level 4)
	Level 2 – Level 3	-1.411	0.054	Not Significant
	Level 2 – Level 4	-1.940	0.001	Significant (favoring Level 4)
	Level 3 – Level 4	-1.594	0.488	Not Significant
Cardiovascular–Respiratory Efficiency	Level 1 – Level 2	-1.021	0.389	Not Significant
	Level 1 – Level 3	-1.895	0.031	Significant (favoring Level 3)
	Level 1 – Level 4	-2.306	0.007	Significant (favoring Level 4)
	Level 2 – Level 3	-0.586	0.340	Not Significant
	Level 2 – Level 4	-0.957	0.109	Not Significant
	Level 3 – Level 4	-0.463	0.142	Not Significant

Interpreting the results in light of the training characteristics of students at the College of Physical Education and Sports Sciences is considered one of the essential requirements in discussing such studies. We notice a difference in the level of the BMI index, which is attributed to the nature of the students in performing various motor activities and their diversity. Additionally, the gradual increase in the practice of activities and their intensity over the four stages contributes to the students enjoying a high level of good posture and health, enabling them to perform all the physical duties required by the college for various activities. Furthermore, this indicates the college's correct selection in choosing students with good physical build, allowing them to perform all movements and avoid the risk of injury or obesity, which would hinder the performance of various motor activities in practical lessons. As Gheid Mandoub Obaidat (2015) [7] confirms, "students of the College of Physical Education can maintain their physical and health fitness levels, which result from their practical training thru the educational lessons they study within the college, in addition to their participation in various sports activities. These contribute to regulating and maintaining their body mass index, granting them a positive health indicator."

[7] **Ghaid Mandoub Obaidat (2015).** "Body Self-Concept and Its Relationship with Body Mass Index and Muscular Strength among Physical Education Students at Yarmouk University," *Mutah Journal for Research and Studies*, Vol. 30, No. 3, p. 59.

As for the indicators of (physical fitness and respiratory circulatory efficiency), the significance of the results is attributed to the continued repetition of organized physical activity, which in turn leads to clear adaptations in the cardiac and muscular systems, and is reflected in the indicators used in the evaluation. The improvement in the results of the Harvard step test for the third and fourth stages, as shown by the difference results, is attributed by the researcher to university students, particularly in their third and fourth years. This improvement is due to the continuous engagement in sports activities over 3 to 4 years, which in turn has contributed to the enhancement of cardiac and muscular functions, and has increased the level of physiological adaptation during rest and physical exertion. Additionally, it has raised the level of physical fitness and its components according to the nature of practicing various activities and games. Studies have also indicated that students in their early years may show varying levels depending on their sports background before joining the university. However, these differences often diminish as they progress in their studies due to exposure to common and gradual training programs. [8]

It should also be noted that the results may be influenced by personal and environmental factors, such as individual commitment to extracurricular activities, dietary patterns, sleep hours, and levels of academic stress. However, the greatest impact remains from the mandatory practical curriculum within the college. Perhaps the slight differences between some students in physiological indicators can be attributed to variations in sub-specializations or pre-university sports experience. Multiple Arab studies have indicated that students with prior sports experience show initial superiority in the indicators; however, standardized training within the college contributes to reducing the variance over time. [9]

On the other hand, the values derived from the anaerobic capacity test among students show a good level of efficiency in the phosphagen and glycolytic systems, which can be linked to the nature of physical activities that involve periods of sudden and intermittent effort, such as quick strength exercises and competitive games within the college. Recent foreign studies have shown that student athletes who undergo short, high-intensity training programs have a higher capacity for anaerobic energy production compared to non-athletes, even if they do not have a professional background, which supports the rapid adaptability to the requirements of the academic specialization. [11] [10]

It can be said that the achieved results indicate that the students of the College of Physical Education and Sports Sciences at Samarra University generally enjoy a good level of general health in light of the selected physiological indicators, and that this level is largely attributed

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[8] **Ali Hatim Al-Shammari (2019).** "The Relationship between Aerobic Fitness and Anaerobic Capacity among Physical Education Students," *Karbala Journal of Sport Sciences Education*, Vol. 11, No. 2, pp. 201–220.

[9] lsaidy, W. S. I., El-Sherif, M., & Hassan, A. (2011). Validity and reliability of the Harvard Step Test in predicting VO$_2$max among physical education students. Journal of Physical Education and Sport Sciences, 4(2), pp. 67–79.

(1) محمد رائد البغدادي: صلاحية استخدام اختبار هارفرد للخطوة في تقدير التحمل القلبي التنفسي لدى طلبة الجامعات. مجلة دراسات وبحوث التربية الرياضية، جامعة البصرة، العدد 14، 2020، ص 55–74.

(2) García-Ramos, A., Santos, D., & Molina, R. (2022). Relationship between heart rate variability and Harvard Step Test performance in university athletes. International Journal of Exercise Science, 15(3), pp. 102–115.

to the nature of the physical and educational training they undergo during their years of study. Their participation in university championships and continuous field tests also enhances their ability to adapt to aerobic and anaerobic demands, thereby improving their functional and health efficiency.

4- Conclusions and Recommendations

4-1 Conclusions

1- The Body Mass Index (BMI) results showed that most students have a healthy physique and are in good health, reflecting the effectiveness of the college's training and academic environment in promoting physical health.

2- The Harvard tests and anaerobic capacity showed that students' levels of physical fitness and cardiorespiratory capacity gradually improved throughout their studies due to their continuous participation in sports activities within the academic curriculum.3- The results confirm that the practice of organized practical activities within the college's courses contributes to achieving a balance between aerobic and anaerobic capacities, which enhances physiological adaptation and reduces individual differences among students over the years of study.

4-2 Recommendations

1- The researcher recommends continuing to develop the college's practical activity programs, gradually increasing the intensity and scope of exercise to enhance the physical fitness and cardiorespiratory efficiency indicators for all students.

2- It is essential to implement periodic tests of general health indicators such as BMI, physical fitness, and anaerobic capacity to assess students' levels and guide them towards improving their physical and nutritional lifestyles.

3- It is recommended to encourage students to engage in university championships and extracurricular sports activities to strengthen physical and physiological adaptation and enhance endurance and aerobic and anaerobic energy production.

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2. Abu Al-Ala Ahmed Abdel Fattah & Mohamed Sobhi Hassanein (2003). *Exercise Physiology and Training*, 1st Edition, Cairo: Dar Al-Fikr Al-Arabi, p. 612.
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