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RATIONING A HEALTHY BREATHING TEST TO ASSESS FORCED AND VITAL EXHALATION AT DIFFERENT MOTOR CONDITIONS ON HEALTHY VOLUNTEERS FROM SPORTS SCHOOLS

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Abstract: Testing, the test and measurement of a renewed nature, including healthy breathing to suit the local environment, and verification of the reliability of healthy breathing tests for forced and vital exhalation, with the development of criteria evaluated by different motor conditions for some healthy volunteers from sports schools, and tests were designed and presented to experts to obtain virtual honesty as well as the sincerity of the hypothetical composition, and then discriminatory honesty was conducted as indicators of the validity of the test, After that, the test was adopted and re-tested in order to find stability with the objectivity of measurement to use the means of recording with electronic technology to achieve the construction of the test, and the researchers extracted a sequential standard degree that explains the raw degree of the sample to be codified test, concluding that the healthy breathing test for vital exhalation has the scientific foundations of honesty, stability and objectivity with high degrees and less than a healthy breathing test for forced exhalation with a standard standard in evaluating levels, He recommended the adoption of scientifically designed and standardized tests with the adoption of its standards in the local environment and the attempt to conduct similar studies for other samples and review the reliability of the forced healthy breathing test.

Keywords: rationing, healthy breathing test, forced and vital exhalation.

Introduction

Our world today is going through different environmental and health conditions, and what happened in the coronavirus pandemic is the best example of its impact on people, including athletes of sports schools, to stop their activities for a period, which limited their physiological response that depends on healthy breathing to perform comprehensive motor duties, and how to continue scientific giving when codifying its measurement and evaluation in a standard manner that achieves sports and health goals together.

Since sport and its various movements affect healthy pulmonary breathing, whether by inhaling or exhaling with laboratory measurement, an attempt to find a field measurement method available and suitable for the capabilities of sports schools, which is at the same time an assessment method that contributes to providing realistic solutions, even in the form of tests designed and proposed for the local environment.

The vital breathing of humans results from inhalation, the taking of air that contains valuable oxygen for the human body, and the excretion of carbon dioxide in the exhaled air (Donald, 2017). During inhalation, the diaphragm muscle contracts, so the chest space expands, the lungs expand, the air enters, and then they return to normal, exhaling outside (Reem, 2017, p. 61) .

Lung biorespiration is a repeatable harmonic performance that sustains gas exchange in the lungs through the process of relaxation of the diaphragm and the entry of air to it by taking an inhalation and then relaxing its muscles, contracting the rib cage and pushing the air to the outside by the process of pulmonary exhalation (Maad, 2011, p. 112) .

Measuring human spirometry is done with advanced devices such as the spirometer with a technical reading of data with multiple variables (John, 1982, p. 173), and the respiratory variables include the maximum vital

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capacity, the volume of exhaled air, the volume of voluntary breathing, the maximum volume of air, the maximum speed of exhalation, and also includes the extent of the flow of exhaled air (Ahmed, 2013, p. 145) .

He pointed out (Myrianthefs, 2014) that spirometry is a test of the functions of the lungs that measures the amounts of an individual's inhalation of air and exhalation in terms of time, so healthy breathing is measured by laboratory measures for exhaling air strongly and with one forced batch, and also measured by the amount of air push within one second as well as the most extended period to achieve prevention of the respiratory system, diagnosis and evaluation.

Modern devices have evolved significantly until it became possible for a small device to measure several variables simultaneously, including spirometry devices with variables such as maximum respiratory capacity (MVV) and forced vital capacity (FVC). Despite their high prices, they need continuous calibration and a high degree of know-how in conducting measurement in its various forms (Bordesley, 2012).

Altan (2012) confirms that pulmonary respiratory function tests can give a qualitative assessment on the one hand and quantitative on the other hand. They represent a diverse estimate of pulmonary vitality related to several variables, especially in sports and all its educational and training aspects. It is based on the evaluation and comparisons between non-athletes efficiency through testing and measurement of their vital ability.

The study (Miller, 2005) aimed to standardise the standard of scientific pulmonary respiration, as successive tests were conducted after 30 minutes, and concluded its agreement with the standards of the International Organization (ISO) and the accuracy of its measurement with the traditional value, and recommends the acceptance of the definitions of its standards, and the frequency that approximates the compatibility between the results of successive measurements of the same element, as well as the recommendation for continuous verification of the reliability of the standards.

The study (ATS: 2005), which aimed to standardise the lung function test and verify the criteria for pulmonary function testing to be the beginning of the adoption of its use in a standardised manner, as the acceptance criteria for spirometry that provide professional assistance were designed for technicians to improve its techniques to reach better reliability, and concluded the possibility of forced biopower defect (FVC) for forced exhalation volume in just one second for the beginning of rapid puffs without taking peak expiratory flow (PEF), the study recommended achieving the end-of-test standard (EOT) to ensure the best estimate. Quantitative for (FVC) .

In the study (Agarwal, 2007), the mechanical function of the lungs was measured by measuring the peak of vital breathing and comparing it with the forced breathing manoeuvres in healthy volunteers. The evaluation of exhaled air for the total lung capacity was done with separate devices to measure different expiratory manoeuvres.

The study (S. Mazic, 2015) aimed to measure pulmonary respiration and find pulmonary function standards and indicators in elite athletes and compare vital breathing capacity (VC), forced respiratory capacity (FVC), forced exhalation volume in one second (FEV1), and maximum voluntary ventilation (MVV), and was applied to athletes belonging to 15 different sports disciplines, and concluded that elite athletes have statistically higher vital ability than normal healthy individuals in both measuring vital capacity (VC) and breathing capacity. Forced (FVC), forced exhalation volume of 1 second (FEV1), and recommended lung function testing according to ATS/ERS guidelines, working to improve lung function and healthy breathing.

The study (Tijana, 2015) for the sports aspect confirmed that all age groups in different types of sports showed that elite athletes have higher standard values in measurements of healthy pulmonary breathing and come in a high position in their reference values. The study concluded that the values of forced vital capacity, forced exhalation volume, vital capacity, maximum voluntary ventilation and all variables for respiratory functions

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are in the interest of athletes and recommend the need to continue scientific research in healthy breathing tests for various groups of society.

The study (Stanojvic S. & others 2021) aimed to measure pulmonary respiration and adopt the standard of pulmonary function tests according to reference equations within the Global Initiative for Measuring Lung Functions, which concluded by adopting a technical strategy for (ERS/ATS) in interpreting tests for lung function, with a recommendation to take into account the natural changes that occur in lung function over time, and to establish a rationale for approving their scores.

Studies state that the spirometer is used to measure pulmonary breathing for exhalation. In contrast, the respirometer measures inspiratory air, and both are laboratory-measured (Atheer, 2020). The above topics are related to clinical medical research. The researcher did not find a field test that measures breathing with a sports vision for fitness according to standard standards that are easy to read and understand in laboratory measurements of pathological conditions .

The search for an available field alternative that includes a variety of motor performance that helps those concerned with healthy interactive physical work that includes three positions in which the upper part of the lungs is above once when standing, once on a horizontal line with its lower part when kneeling, and once it is under the lower part of the lung when prostrating, which forms pressure on it that increases air propulsion to achieve healthy breathing .

Among the information of previous studies that formed the theoretical framework, steps of practical application and the benefit provided to humanity as a whole in providing means of prevention and vital health, with its statement of the path of continuous scientific research in healthy breathing, which benefited the current study with an attempt to enrich its measurement in a field manner that suits the local environment corresponding to the field activity in a realistic manner appropriate to life conditions.

Here lies the importance of research in measuring and evaluating healthy breathing, as well as the fact that each test is an exercise in itself if conducted in the actual field, and activating this by developing local tests that are easy to implement that save time, effort and material cost, as well as the possibility of self-use, which constitutes an evaluation pillar when identifying healthy proper breathing continuously to interpret the result of exhalation of various types and various body movements and positions to achieve vitality.

The research problem came after the (Covid-19) virus and its pulmonary effects in particular, as an inductive idea that stimulates scientific research in various fields, especially the aspect of sports tests, which are at the same time scientifically and practically codified exercises that contribute to measuring expiratory breathing, which provides vital protection, which prompted researchers to design a field test for healthy breathing that provides part of the scientific solutions.

In questions raised by the researchers, are there local field tests that measure healthy breathing in sports schools that consider motor diversity, are there criteria that explain their raw grades, and do the tests constitute a scientific path to answer the question?

Research goals and objectives

- Verify the reliability of a healthy breathing test designed for forced and vital exhalation .
- Setting standards for forced and vital breathing in the kinetic positions of athletes.

Define research terms and their theoretical and procedural definitions.

- Field tests are practical application procedures by field experimentation within the actual environment of measurement performance (procedural definition) .
- Healthy breathing: It is the process of correct breathing in delivering the appropriate amount of air that contains oxygen needed by the body's cells during exercise and the most significant amount of air that contains carbon dioxide (Juddit, 2004, p. 22) .

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- Healthy breathing tests: These are situations designed for breathing by taking and subtracting as much atmospheric air as possible to measure respiratory fitness indirectly (procedural definition).

Material y methods

Study Design

The descriptive approach was chosen because it is the most appropriate for the nature of the research(Fayyad et al., 2025; Khalaf et al., 2025) .

Participants

The research sample consisted of healthy volunteer athletes aged between (18-20) years from the sports school community, amounting to (5) participants for the exploratory experiment, (30) for the experiment of building tests, (230) for the experiment of rationing tests.

Research tools and requirements

Scientific sources, such as a questionnaire, personal interview, registration form, information network, electronic computer, and designed test and its requirements, were used.

Test design according to the scientific content

The test was designed according to the scientific content of the breathing process for vital and forced exhalation. A preliminary design was developed to blow air into a balloon and blow air with a water hose inside a transparent water bottle (10 litres) and then blow water inside a water hose 25 m long, with an applied performance that conforms to its theoretical framework .

Exploratory experiment and correction of tests

A mini-exploratory experiment was conducted on five athletes with the help of an assistant team in order to achieve practical benefits and increase their scientific information in the test and measurement (Appendix 1). It was found that calibration using balloons to measure vital breathing capacity was not appropriate, to be replaced by a prolonged air exhalation test by jetting in a water bottle of (10 litres) by a water hose with a length of (3 m). It was noted that the forced breathing test was unrealistic, with a long water hose (25 m) to be replaced by a test design. It is based on one momentary strong forced puff on a light ball with a diameter of 6 cm and a mass of 100g.

Scientific foundations for the construction of the test

The researchers relied on the agreement of nine experts (Appendix 2) in the compatibility of tests designed for respiration with the theoretical concept of slow exhalation with a continuous jet for as long as possible. Their agreement also on the compatibility of tests designed for forced breathing with its concept of rapid exhalation with one strong puff, so the hypothetical honesty was achieved for the compatibility of its theoretical composition with what is intended to be measured for both vital and forced healthy breathing tests together, the sincerity of the hypothetical composition expresses the degree of compatibility of the test with the theoretical property It means designing a scale in the light of a scientific theory with its assumptions of the compatibility of the scale with the adopted theory and with a specific goal of whether the design represents the theory or not (Soumya, 2019, p. 678) .

As well as the verification of the apparent honesty of the arbitrators by (100%), as the sincerity of the arbitrators extends to the logical honesty and surpasses it in the sincerity of the test (Taima, 2004, p. 215), and the decisions of the arbitrators are considered quantitative objectively and by a percentage in their agreement as a reference to the conformity of the tests with their objectives and achieve the sincerity of the test (Al-Nabhan, 2004, p. 280), and the sincerity of the arbitrators, which depends on the principle of evaluation arbitration for experts of what should be the name of the test and its conformity to its content and details is the sincerity of the content (Allam, 2000, p. 195), and the validity of the arbitrators is an apparent honesty to inform experts about the form of the measured attribute as well as the truthfulness of the content when

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quantitative evaluation, which is a guide to the validity of the test within the test and measurement standards necessary for the validity of a building according to the target purpose (Stephen, 2014, p100) .

It has also been achieved the veracity of the terminal comparison, which is between two independent parties, such as comparing the test to the test or comparing the upper third with the lower third and the adoption of statistical significance while giving a quick indicator of the validity of the test (Abu Hisham, 2006, p. 27). The researchers have verified the credibility of the discriminatory comparison of the terminal values of the upper and lower values, which were their values (4.97, 3.66, 3.16, 7.01, 9.13, 7.02) respectively, all of which are greater than the tabular (2.06) at the level of significance (0.05), Tabular (2.11) at the level of significance (0.01) thus achieving the scientific basis for the validity and validity of the test .

The stability of the test was verified by a method (test and retest). The correlation coefficient was found for the variables of forced exhalation from lying on the abdomen and on the right side and prostration position, as well as the variables of slow vital exhalation from the position of standing, bowing and prostration. They were respectively (0.48, 0.42, 0.74, 0.88, 0.84, 0.85). Although the correlation is significant significance, being greater than the tabular value (0.349), the stability coefficient gives a rejection of the relations according to the stability coefficient table and the interpretation of its results for consistency values less than (0.50). They are unacceptable in both a negative and positive direction (Cortina, 1993), meaning that the forced exhalation tests from the anterior abdominal and lateral lying positions are unstable.

The researchers attribute the reason for this to the difficulty of adjusting the variables of these two tests, which gives uneven and unstable results when re-applied, while it appeared that the forced exhalation test from the position of prostration is acceptable enough to adopt its stability, while the three types of slow bio-expiratory test enjoy good stability because their values are confined between (0.80 - 0.80), and the method of testing and returning it is one of the methods of stability that depends on the time variable between the two applications and the calculation is used for the correlation coefficient between the two optional degrees and the consistency of the scores of individuals if It was reapplied to them again (Ghoneim 2004, p. 72), and finally the researchers relied on realism in determining the test scores for measuring the time of smart devices and weighing with a sensitive electronic balance in calculating the results technically away from subjectivity and different understanding to give objectivity to the test in adopting technically refereed measurements, as well as adjusting its procedures by writing tests in a unified final form, and thus the scientific foundations of the sound test are achieved, which achieves the first goal of the research.

Writing the tests in their final form

Test Name: Healthy Breathing Test .

Test objective: Measure the exhalation of vital expiration time and distance of forced exhalation .

Test kits: rubber ball with a mass of (100) and a diameter of (6 cm), a water hose with a length of (3 m), an inner diameter (of 1.25 cm) and an outer (1.50 cm), and a transparent water bottle with a volume of (10 litres) with a stopwatch from smart mobile devices.

How to perform: First - Measure the forced exhalation by lying the laboratory on his stomach by placing the front prone and his mouth behind the rubber ball on the start mark, then doing a sudden rapid strong puff that rolls the ball as far as possible, then lying sideways on his right side with the implementation of the same test mentioned in the first, and then prostrate with his body passing over the ball and blowing on it to pass between his legs to the farthest possible distance .

Second - biometric exhalation in another test where the laboratory stands holding the hose (3 m), takes a deep breath experimentally and then takes the broadest possible inhale and blows the air quietly for the most extended possible period as the other end of the hose immersed and touching the bottom of the bottle filled with five litres of water. After the exhalation, sit again on the chair to rest for one minute. This procedure shall

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be repeated from the position of bowing and then from the position of prostration and in a performance similar to the above .
How to record: First, the collected water bottle is placed on the scale, and its weight is calculated in kilograms from the water-blowing test. Secondly, the time of the three tests to exhale air in the bottle is collected, and the new performance can be illustrated in Figure.(1)

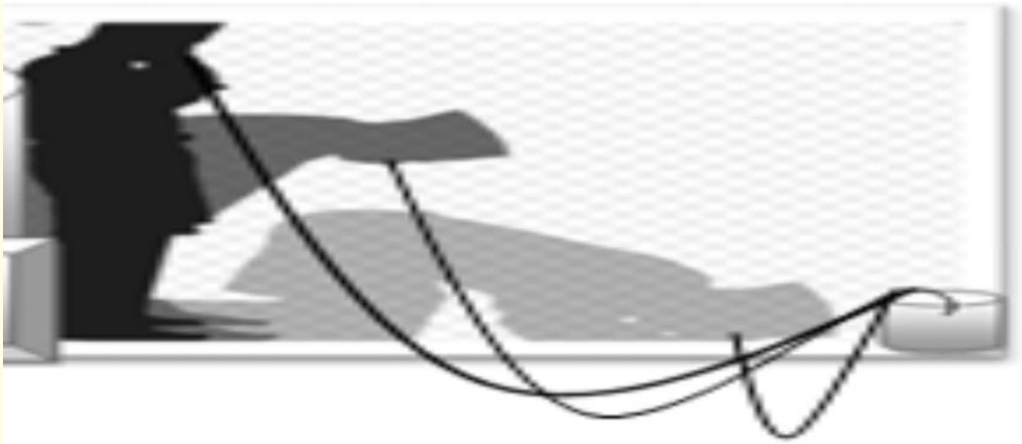

Figure (1) shows the vital breathing test of standing, kneeling and prostrating.

Figure 2.
shows the forced breathing test from front and side lying and prostration

Statistical treatments
used Percentage, mean, standard deviation, adjusted standard T score and constant number using the statistical program (Excel) from the (Microsoft Office) suite(O. A. Ali, 2022; O. Ali & Hamid, 2021; Hammood et al., 2024).

Results
Presentation of the statistical description of the codification sample.
Table 1.
shows the statistical description of the rationing sample for health exhalation

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Variables with a unit of measure	Arithmetic mean	Standard deviation	Broker	Torsion coefficient	Fixed Number
Forced exhalation distance(cm)	2.25	0.882	2.05	0.680-	0.088
Exhalation time prostrate (sec)	31.15	9.450	33.35	0.698-	0.945
Exhalation time (seconds)	28.70	13.150	26.20	0.559	1.315
Standing exhalation duration (sec)	30.55	10.75	33.85	0.921-	1.075
Total time of vital expiration	30.13	11.117	31.15	0.272-	1.112

Presentation and discussion of the sequential adjusted T-grade standard

Table 2

shows the sequential degree of forced and vital exhalation of all kinds.

Forced exhalation distance	Exhalation duration prostrate	Duration of exhalation kneeling	Duration of exhalation standing	Total degree of exhalation	Total degree of exhalation
6.65	78.4	94.45	84.3	85.717	100
5.77	68.95	81.3	73.55	74.600	90
4.89	59.5	68.15	62.8	63.483	80
4.714	57.61	65.52	60.65	61.269	78
4.538	55.72	62.89	58.5	59.045	76
4.362	53.83	60.26	56.35	56.821	74
4.186	51.94	57.63	54.2	54.597	72
4.01	50.05	55.00	52.05	52.373	70
3.834	48.16	52.37	49.9	50.149	68
3.658	46.27	49.74	47.75	47.925	66
3.482	44.38	47.11	45.6	45.701	64
3.306	42.49	44.48	43.45	43.477	62
3.13	40.6	41.85	41.3	41.253	60
2.954	38.71	39.22	39.15	39.029	58
2.778	36.82	36.59	37	36.805	56
2.602	34.93	33.96	34.85	34.581	54
2.426	33.04	31.33	32.7	32.357	52
2.250	31.15	28.70	30.55	30.133	50
2.074	29.26	26.07	28.4	27.909	48
1.898	27.37	23.44	26.25	25.685	46
1.722	27.37	20.81	24.1	23.461	44
1.546	23.59	18.18	21.95	21.237	42

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1.37	21.7	15.55	19.8	19.013	40
1.194	19.81	12.92	17.65	16.789	38
1.018	17.92	10.29	15.5	14.565	36
0.842	16.03	7.66	13.35	12.341	34
0.666	14.14	5.03	11.2	10.117	32
0.49	12.25	2.4	9.05	7.893	30
0.314	10.36	1.085	6.9	5.669	28
0.138	8.47	---	4.75	3.445	26
0.05	6.58	---	2.6	1.221	25
---	4.69	---	0.45	0.109	24
---	2.8	---	---	---	22
---	0.91	---	---	---	20
---	---	---	---	---	10
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Discussion

Table (1) shows the arithmetic means and standard deviations with the median and the extracted value of the torsion coefficient in the research variables to single out the sample of rationing, and since all values are within the boundaries of the area confined between (±3) of the standard normal distribution, which means moderation of distribution when processed by the median, which divides the data into two equal parts for before and after (Al-Sumaidai, 2010, p. 47), as well as finding the fixed number for each variable to be used to find the sequential T standard.

Table (2) shows the arithmetic averages of the raw grades that reached the forced exhalation distance (2.250 m) and the total vital expiratory time (30.133 s). At the same time, it was (30.55s) for the exhalation standing (28.70s) for the exhalation kneeling, (31.15) for the prostration exhalation, and (Myrianthefs, 2014) confirmed that spirometry is the standard lung function test, which measures an individual's inhalation and exhalation of quantities of air in exchange for time. It is the most important and standard pulmonary function test procedure, as it has become indispensable for preventing, diagnosing and evaluating respiratory impairment. Yasmin 2021 also indicated that measuring healthy breathing fitness with predictive values with peak oxygen consumption and dual breathing capacity as a preventive measure is integrated with exercise to form physical and aerobic fitness that supports the work of the heart and lungs. Changes occur in the mechanism and functions of breathing due to regular and continuous exercise and training, which increases breathing rate, depth and volume during breathing (Mohamed et al., 2006, p. 16). Its raw grades have been treated with the sequential standard T degree with the fixed number, and because the abstract numbers do not have an honest and straightforward significance, which requires the existence of specific criteria to be compared with, including the sequential standard degree, which is the result of the treatment of the arithmetic mean with the fixed number, which is (5×±p)/50 as a picture representing the raw degree at the arithmetic mean and the standard deviation (±p) and the formation of a clear criterion that can be interpreted (Mazen, 2003, p. 76).

Moreover, the fact that the fixed number is equal to [(5×standard deviation)/50] and the deviation of ten degrees, it can be simplified to (standard deviation/10), and the t-tracking method is used by extracting the arithmetic mean of the raw degrees and placing it in front of the standard degree that is equal to fifty, then adding the fixed number to the corresponding standard degrees sequentially by increasing and decreasing the fixed number and the arithmetic mean (Qaisi, 2018, p. 55). Standard scores have been developed for field tests designed as an alternative and realistic solution available to all researchers in respiratory fitness examination,

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and the fact that physiological field tests in the field of physical education have recently entered their economy and provide quantitative diagnostic information predictive of the functional possibilities of athletes as well as the development of standards as an important goal for sports tests and measures in order to help in good selection (Radwan, 2013, p. 31). The field physiological tests, such as the test of running on the track of the stadium measuring time and heart rate, are indirect measurements and a low-cost and easy-to-apply method (Aqeel, 2003, p. 88), which is what the researcher went from indirect measurement in his tests designed with the diversity of their performance by more than one part to all cooperate in obtaining accurate results of respiratory fitness from different positions starting standing and then kneeling and ending prostrate as well as the force of exhalation. The development of a sequential standard for assessing healthy breathing fitness in the designed tests achieves the second objective of the research as well as dividing the results in measuring healthy breathing fitness into three proposed levels of raw scores located from (20%) to (39%) are evaluated as poor level, and from (40%) to (59%) evaluation at an average level Finally, the evaluation from (60%) to (80%) is described as strong.

The development of models for estimating and evaluating the level of aerobic fitness of the participants and dividing them according to reference criteria is important in physical education as a balance between accuracy and ease of interpretation in its field research (Matthew2018, p239), and aerobic respiratory fitness is keen to deliver oxygen to the body and its muscles as used in the field test of the progressive running exercise as a gold standard for aerobic fitness for young people (Armstrong 2011, p859).

Conclusion

- Field inhalation and exhalation tests measure the fitness of healthy breathing for second-year students of the College of Physical Education and Sports Sciences at Anbar University.
- Tests designed for healthy breathing have the scientific foundations to build a good test of truthfulness, consistency and objectivity.
- Designed tests have the discriminatory power of terminal comparison between individuals with higher scores for tests and individuals with lower scores on designed tests.
- The possibility of developing local field tests for indirect physiological measurement of the pulmonary respiratory variable under very accurate control of the method of performance and recording.
- The researcher concluded the possibility of setting a sequential criterion in the interpretation of the raw grades of the sample, as well as a tripartite level that contributes to determining the respiratory fitness of students of the Faculty of Physical Education and Sports Sciences

Note: The tests designed above can be used as standardised exercises to develop the sapphire's achievement with his vital fitness and the competitive advantage that enables it to be conducted in the form of races between individuals.

Research recommendations

- The researcher recommends adopting healthy breathing tests as an indirect measurement of respiratory fitness for students of faculties of physical education and homogeneous with the research sample.
- The researcher recommends referring to the sequential T criterion in interpreting the results if the test designed on a sample that is homogeneous with the research sample is conducted.
- The researcher recommends verifying the scientific foundations of the tests designed in this research in other ways, methods and types and trying to set other criteria.

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- The researcher recommends moving forward with this first step to build physiological field tests that are available to everyone and take into account the economical cost, time and effort.
- The researcher recommends adjusting the measurement method as it is the most challenging method for representing accurate data.
- The researcher recommends other similar studies on other health variables.
- Make adjustments, evaluate the designed tests, apply them to other samples for different age groups, and try to set criteria that include a broader category of the study sample.

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