

The effect of the sports season on certain physiological parameters of young footballers "A field study on the Boumahra Ahmed U17 team"

تأثير الموسم الرياضي على بعض الصفات الفسيولوجية للاعبين كرة القدم الشباب
"دراسة ميدانية عن فريق بومهرة أحمد تحت 17 سنة"

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Abstract:

This research aims to identify the effect of the sports season on some physiological parameters, including VO2 max, resting heart rate, and max heart rate in young soccer players. The sample consisted of 20 soccer players under the age of 17 from O.R.B. A descriptive approach was used, and the researcher used appropriate tests to collect data, such as the shuttle test and heart rate monitoring by a Polar M430 watch, which were conducted at two different time points during the season (pre- and post-season). SPSS statistical software was used to analyse the collected data. The results revealed a significant improvement in VO2 max and resting heart rate. In contrast, there were no significant changes in the maximum heart rates during the sports season for the soccer players. These findings have important implications for coaches and athletes, providing valuable insights to enhance training strategies and overall athletic performance.

Keywords: Sports season; VO2max; Resting Heart Rate; Maximum Heart Rate;

Introduction:

Soccer, the world's most cherished and universal sport, transcends borders and cultures to unite humanity in a shared celebration of athleticism and competition. Known as football in many regions, this captivating game weaves a tapestry of emotions, inspiring joy, camaraderie, and fierce loyalty among players and fans alike. Football is considered the best sport, being the most popular and successful, it is estimated that more than 4 billion people worldwide are football fans, making it the most watched and played sport globally “During the 1998 FIFA World Cup, Football Association (FIFA) estimated that more than 4 billion spectators watched the game on TV” (Magal & al, 2009, p. 1). Beyond its surface, however, lies a captivating realm of scientific exploration that delves into the intricate interplay between soccer and the human body's physiological intricacies. This journey from the field to the laboratory is marked by a relentless pursuit of understanding the effect of sports seasons on the physiological qualities of young soccer players.

The allure of soccer extends far beyond the boundaries of the pitch. Its fast-paced dynamism, strategic depth, and moments of brilliance forge a connection that traverses language and culture. This sport's magnetic pull draws players and enthusiasts from diverse backgrounds, uniting them under the banner of a shared passion. Yet, beneath the euphoria of victory and the lessons of defeat lies a realm ripe for scientific exploration—how does the intense physical demand of soccer season after season shape the bodies and capabilities of its devoted players, and how it effect on body human. These demands “significantly affect the functional and organic levels of the athlete and contribute to the development of various physical, motor, tactical and voluntary capabilities that greatly affect the functional and organic levels of the athlete and contribute to the development of various physical, motor, physiological and voluntary capabilities” (علاوي، 1994، صفحة 51).

This convergence of sport and science has catalyzed an evolution in soccer's narrative. The once pristine grass fields have become laboratories where physiological testing meets the athleticism of players. In this crucible of investigation, physiological testing emerges as a compass guiding players and coaches towards enhancing performance, mitigating vulnerabilities, and optimizing overall physical well-being, "The greatest benefit of the test results is that it shows the athlete that their hard work and training is paying off, This prevents you from having to persuade the athlete to work hard, and instead they take ownership of their training. Especially if the athlete has aspirations to get to the next level such as collegiate or professional, you can show your athlete how other athletes at the next level perform in these tests, and you can set goals for the athlete to strive for” (Medicine, 2015), Amidst this intricate tapestry of tests, physiological assessments emerge as the lynchpin, unraveling the secrets of cardiovascular endurance, muscular strength, and the finely tuned mechanisms of the human body.

While these physiological transformations unfold in a dazzling choreography on the global soccer stage, they hold particular significance for the emerging talents—the young soccer players whose dreams are just beginning to take flight. These aspiring athletes, with unwavering determination, embark on a journey that extends beyond the roar of the crowd. This journey is etched with the sweat of training, the thrill of competition, and the pursuit of excellence. The crescendo of a sports season resonates within their bodies, catalyzing adaptations that manifest in every sprint, pass, and goal, all that with "a set of physical exercises and efforts that lead to functional adaptation or change in the internal body systems to achieve a high level of athletic achievement” (البساطي، 1998، صفحة 2), or a functional change in the body's internal systems to achieve a high level of athletic achievement.

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As players engage in rigorous training sessions and fierce matches throughout a sports season, their bodies orchestrate a symphony of changes. These adaptations span beyond the field, infiltrating the cardiovascular, respiratory, muscular, and neural domains. The human body, a testament to its remarkable resilience, morphs in response to the sport's demands, "The body's physiologic responses to episodes of aerobic and resistance exercise occur in the musculoskeletal, cardiovascular, respiratory, endocrine, and immune systems. These responses have been studied in controlled laboratory settings, where exercise stress can be precisely regulated and physiologic responses carefully observed" (services, physical activity and health, 1998, p. 61). It evolves, adapts, and thrives, epitomizing the symbiotic dance between human ambition and physiological malleability.

Reverberates throughout Algeria and beyond, a research chasm persists within the Algerian context. A scarcity of comprehensive investigations plagues the understanding of how sports seasons modulate the physiological traits of young soccer players. While the fervor for soccer burns brightly in Algeria, the science illuminating the nuances of the sports season's effects on players remains dim.

This research endeavor aims to illuminate this darkness, to shed light on the physiological odyssey that young Algerian soccer players embark upon. We traverse soccer's multifaceted landscape, traversing its global resonance, unraveling the significance of physiological assessments, and delving into the metamorphosis of players' bodies as they navigate the throes of a sports season. Within this journey, a greater ambition emerges—to advocate for the advancement of scientific research within Algeria's sporting tapestry. By augmenting our understanding of sports science, this study endeavors to empower not only young athletes but also the broader scientific community, igniting a beacon of knowledge that guides players, coaches, and enthusiasts alike on the path to excellence.

Research problem:

In the realm of sports, where aspirations intertwine with unwavering dedication, young athletes embark on a transformative journey marked by sweat, determination, and an unrelenting pursuit of excellence. The crucible of hard training becomes their daily routine, propelling them closer to their goals. However, beneath the sweat-soaked jerseys and resounding cheers, lies a deeper principle—the essence of continuity. This principle, intricately woven into the fabric of training methodology, acts as a guiding beacon, illuminating the path through challenges and fostering gradual growth, ultimately solidifying their evolution as athletes.

Embracing this tenet of continuous progress, athletes enter a realm where training transcends mere routine—it becomes a catalyst for change. Physical transformations materialize, muscles sculpted through unwavering dedication to disciplined repetition. Yet, the metamorphosis extends beyond the tangible, solidifying mental resilience through early morning sessions and late-night practices. This fusion of physical and mental growth births athletes whose prowess isn't ephemeral brilliance, but a testament to the cumulative power of sustained training.

Accompanying this journey is a physiological symphony that leaves observers awestruck. A group of changes that start from the first days of training and continue throughout the sports season as a result of the intensity of competition and the intensity of training. The heart, a steadfast metronome, adapts to escalating demands, channeling greater oxygen to toiling muscles. The lungs are adapting, their work is improving, Anthropometric measurements interact as a result of the physical effort exerted, muscle mass improves, and

various other indicators are evaluated, without forgetting the physical transformations capture the grace of speed, the finesse of agility, and the explosion of power, all crafted through persistent effort. Amid these shifts, the body transformations testament to the profound impact of meticulous training.

Aligned with these metamorphoses emerges an intrinsic curiosity—a yearning to decipher the intricacies of these changes. This curiosity prompts the researcher to pose meaningful questions, each a stepping stone to comprehensive understanding. These questions act as starting points, propelling a journey into the physiological effects on athletes' bodies. His beck exploration into the outcomes of unwavering commitment and structured training across an entire sports season, embracing variables and dynamic athletic challenges.

Guided by the study's direction, the researcher formulates questions with precision. Targeting the most exciting and enjoyable aspect, which is the physiological aspect. The general questioning was formulated as follows: What is the effect of a sports season on the physiological parameters of amateur soccer players? Delving further, this overarching inquiry fragments into three distinct sub-questions:

1.1 Partial Questions:

- Is the sports season able to positively affect the VO₂max of amateur players?
- Does the sports season have a positive influence on resting heart rate among amateur players?
- Does the sports season have a positive impact on maximum heart rate for amateur players?

To unravel the answers to these pivotal questions, we present a set of hypotheses that guide our study.

1.2 General Hypothesis:

The sports season has a significant effect on some physiological parameters of amateur soccer players.

Partial Hypotheses:

- The sports season has a positive effect on VO₂max of amateur players,
- The sports season positively influences Resting heart rate among amateur players, resulting in decrease in RHR.
- The sports season has a positive impact on Maximum heart rate for amateur players, leading to an increase in MHR.

2. Objectives:

- To assess the potential impact of a sports season on the VO₂max of amateur soccer players.
- To determine whether the sports season has an influence on the resting heart rate among amateur soccer players.
- To investigate the possible effect of the sports season on the maximum heart rate for amateur soccer players.
- To understand how the sports season might contribute to variations in resting heart rate (RHR) among amateur soccer players.
- To explore the potential correlation between the sports season and changes in maximum heart rate (MHR) for amateur soccer players.

3. Defining research concepts and terms:

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- **Sport season:** “It is a comprehensive annual plan that gives us a way to prepare for the development of annual training in order to achieve the goals of sports training... and it includes two basic aspects, all of these aspects are translated into a number of hours and distributed over training programs starting from the daily training period to the weekly program to the monthly program to the season program The entire training” (حسن، 2001، صفحة 356)

- **VO2max:** “the maximum or optimum rate at which the heart, lungs, and muscles can effectively use oxygen during exercise, used as a way of measuring a person's individual aerobic capacity.

The VO2max is the maximum rate (v) of energy production by oxidative pathway. It corresponds to the maximum amount of oxygen (O2) that an organism can use per unit of time (l/min) during intense exercise and/or prolonged exercise” (reiss & pascal, 2013, p. 118)

- **Maximum Heart Rate:** “The maximum heart rate (MHR) is the highest number of beats per minute for your heart. While many coaches and athletes believe this is the most important of all your heart rate data.” (friel, 2006, p. 25)

- **Resting Heart Rate:** is “Your heart rate while fully relaxed and sitting or lying down is your resting heart rate (RHR) and is a decent indicator of changes in cardiovascular fitness. A gradual decline in RHR over several weeks is a fairly accurate predictor of improving cardiovascular fitness and probably indicates that the heart’s blood pumped per beat, called “stroke volume,” is increasing and that the muscles are more efficient at removing oxygen from the blood.” (friel, 2006, p. 23)

4. Methods and Materials:

4.1 Population:

“Is a group of individuals, objects, or events that share common characteristics and are of interest to the researcher” (Nestor & Russell K, 2009, p. 167), in this study, the population consists of all the football teams that are actively playing in the regional league of Annaba, during the season2022/2023. The total number of teams in this community was 12, with an estimated total of 270 players.

4.2 Sample:

Deborah define it “...so they select a subset of individuals from the population, study those individuals, and use that information to draw conclusions about the whole population, this subset of population is called a sample” (Rumsey, 2023, p. 31), our sample contient Twenty boys recruited to participate in our study. (16 +0.5 years old) played for Boumahra Ahmed (Algeria) football team. This group of young amateur players was selected from 270 players representing twelve teams of the Annaba Regional Football league (LRFAnnaba) (ligue regionale de football annaba, 2023).

Table 1. Characteristics of the Sample

	Age (year)	Weight (kg)	Height (cm)	Season (Week)
N = 20	16± 0,5	62± 2	156± 12	24

4.3 Study approach:

The nature of the study is what determines the type of method used, because whatever the subject of the research, the value of the results depends on the value of the methods used". (انجرس و ترجمة بوزيد صحراوي، 2004، صفحة 97).

In our study, we chose the descriptive approach because it is most appropriate to the nature of the research

Descriptive Approach:

The survey or description as a method of experimentation depends on the scientific method, as it measures certain variables, but it differs from the experiment in which the researcher submits the variable to his control according to a specific plan, while the description studies the variables in their natural state without any intervention by the researcher, and thus the study of the phenomenon is under normal conditions" (درويش، 2018، صفحة 118)

4.4 Variables:

Independent variable **sport season.**

Dependent variable: **some physiological qualities.**

4.5 Areas of study:

Special field: ORBBA stadium, and" space Gym"

Time field: from 25/10/2022 to 27/04/2023.

Human field: **20** soccer players (under17)

4.6 Data collection tools:

- **VO2max test: shuttle test Luc Léger**": The Luc Léger test is an endurance test allowing an extrapolated evaluation of **maximum oxygen consumption**. This reproducible and comparative test makes it possible to follow the evolution of the maximum aerobic speed

- **Progressive shuttle test of luc and coll (1982):**

Improperly called the Luc Leger test, this test evaluates both maximal aerobic speed and VO2max through extrapolation. The task involves shuttling back and forth between two markers while synchronizing with the emitted beeps. To find your VO2max:

VO2max = 31.025 + (3.238 * running speed) - (3.248 * age) + ((0.1536 * running speed) * age)).

The beeps remain constant for 2 minutes, but the intervals will subsequently decrease in duration every minute. This test forces us to run faster and faster until exhaustion.

In practical terms, this test only requires 20 meters of space, an MP3 player, or a post. The repeated accelerations and footwork can sometimes fatigue the muscles. It has still been used as a reference for numerous tests. (reiss & pascal, 2013, p. 131)

- **MHR measurement:** The researchers equipped the players with specialized devices, specifically the Polar M430 pulse measurement watch, to monitor heart rate changes throughout the Progressive shuttle test of luc and coll. This watch recorded heart rate variations from the test's beginning to its end. Subsequently, the researcher identified the highest recorded heart rate value, representing the maximum pulse rate achieved.

- **Resting HEART Rate test:** researchers used polar m430 heart rate monitor, and respected the following points:

-**Complete Rest:** Ensure you are completely relaxed and calm. Choose a moment when you haven't engaged in intense physical exercise recently and when you're not feeling stressed.

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-Preparation: Sit or lie down comfortably in a quiet place. Make sure your arms and hands are comfortable and relaxed.

-Pulse Measurement: Count the heartbeats for a full minute. You can use polar m430

-Recording: Note down the number of heartbeats you counted in a minute. This is your resting heart rate in beats per minute (bpm).

-Repetition: To get a more accurate measurement, you can repeat this process over several days and calculate an average of your results.

-Similar Conditions: Try to maintain similar conditions from one measurement to another. Measure your resting heart rate preferably in the morning, just after waking up and before getting out of bed. Avoid consuming stimulants like caffeine before measurement.

-Consistency: For consistent results, try to follow this protocol at roughly the same time each day.

4.7 Procedures for the study:

Pre-Test Phase: The pre-tests were administered at the team's training stadium on Tuesday, October 25th, 2022. In the morning session (8:00 AM), the resting heart rate (RHR) of players was measured. Subsequently, in the evening session (5:00 PM), the shuttle test (20m) and maximum heart rate (MHR) measurements were conducted.

Post-Test Phase: The post-tests were carried out in the same conditions and timing at the team's training stadium on Thursday, April 27th, 2023.

Table 2. Shows the dates of the physiological tests:

	Test 1	Test 2
Sport Season	Week one	Week twenty four
Date	25/10/2022	27/04/2023

4.8 Statistical Analyses:

Statistical analysis is a fundamental aspect of research that enables us to better understand the factors that influence our study and reach meaningful conclusions. The choice of statistical methods depends on the type of problem, data characteristics, and research objectives. In our study, we used SPSS version 26 to perform statistical analysis, and we employed the following methods:

- **Mean:** the sum of all scores divided by the number of scores." (Gravetter & Wallnau, L. B., 2014, p. 110).

- **Standard deviation:** "The standard deviation is a measure of variability that reflects the average distance of any score in the distribution from the mean of the distribution. It is the square root of the variance." (Arthur Aron, Elliot Coups, & Elaine N. Aron, 2018, p. 121)

- **T test:** “is a parametric statistical test used to determine whether two groups of scores are significantly different from one another. It does this by comparing the means of the two groups while taking into account the variability of the scores within each group” (Coolican, 2014, p. 166).

- **Cohen Test:** “Cohens d is a standardized effect size for measuring the difference between two group means. Frequently, you’ll use it when you’re comparing a treatment to a control group. It can be a suitable effect size to include with T-Test and ANOVA results. The field of psychology frequently uses Cohens d” (Frost, 2022).

5. Discussion and interpretation of the results:

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5.1. Validity and reliability of tests:

The researcher reached the validity of the test based on the reliability coefficient, the researcher arrived at the validity of the test based on the stability coefficient, as to obtain the validity of the test, and we calculated the validity coefficient from the following equation:

$$\text{Validity} = \sqrt{\text{stability coefficient}}$$

We got the following results:

Table 3. Results of stability and reliability coefficient of different measurements:

	Stability coefficient	Reliability coefficient
VO2max	0,80	0,89
RHR	0,90	0,94
MHR	0,96	0,97

It is evident from the table that all the correlation coefficients have values close to 1. This indicates a strong stability coefficient and a high degree of validity for the tests employed, highlighting their reliability and accuracy.

5.2. Normality tests:

Table 4. Results of normal distribution of different measurements:

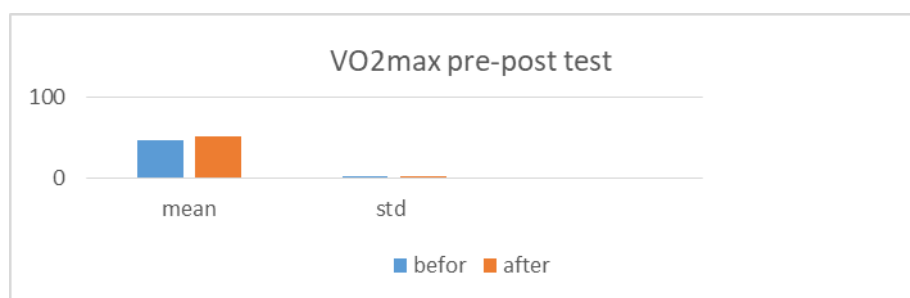
	Shapiro - Wilk signification			Sig	Result
	VO2max	RHR	MHR		
Pre- test	0,063	0,100	0,077	0,05	Normal Distribution
Post- test	0,237	0,251	0,081		

It is evident from the table that all the statistical significance values of the Shapiro-Wilk test, whether for the pretest or the post-test, are greater than the level of statistical significance (0.05). Therefore, we conclude that we fail to reject the null hypothesis, indicating that the data are normally distributed.

5.3 Presentation and analysis of the results of VO2max results:

Table 5. Results of pre and post test of VO2max:

	Before		After		T cal	T tab	sig (2tailed)	Stat sig
	Mean	Std .dev	Mean	Std .dev				
VO2max	47,66	2,33	51,10	3,07	8,52	2,09	0,00	sig



A comparative analysis was conducted between the pretest and posttest results of the VO2max measurement for the sample, utilizing tables. In the pre-test, the mean was 47.66 with a standard deviation of 2.33, while in the post-test, the mean value increased to 51.10 with a standard deviation of 3.07. The calculated T-value was 8.52 at a significance level of 0.05, with 19 degrees of freedom, surpassing the tabular value of T (2.09). These findings

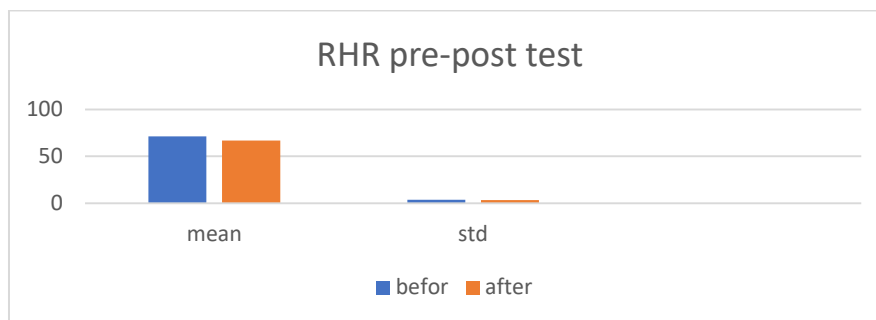
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indicate a statistically significant difference in favor of the post-test. Moreover, the T-Test yielded a significance level (two-tailed) of 0.00, which is lower than the predetermined significance level of 0.05. Consequently, the alternative hypothesis suggesting significant differences in VO₂max between the beginning and the end of the sports season is accepted.

5.4 Presentation and analysis of the results of RHR:

Table 6. Results of pre and post test of RHR:

	Befor		After		T cal	T tab	sig (2tailed)	Stat sig
	Mean	Std .dev	Mean	Std .dev				
RHR	71,20	3,86	66,90	3,44	9,20	2,09	0,02	sig

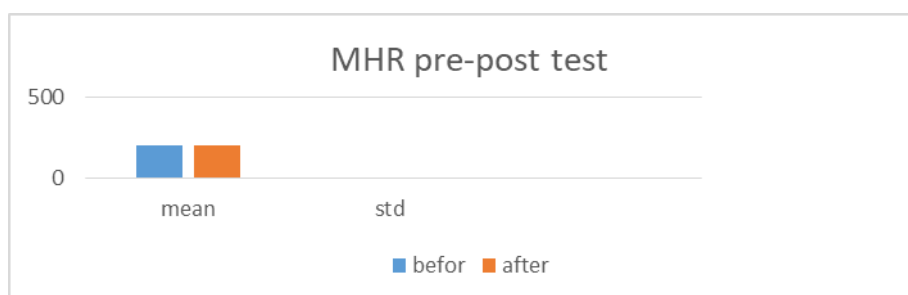


We observed from the table that the results of the pre- and post-tests for measuring resting heart rate in our research sample were as follows: In the pre-test, the mean was 71.20 with a standard deviation of 3.86, while in the post-test, the mean value was 66.90 with a standard deviation of 3.44. The calculated T-value was 9.20 at a significance level of 0.05, with 19 degrees of freedom, which is greater than the tabular value of T (2.09). This indicates, from a statistical perspective, that there is a significant difference between the two tests. Furthermore, the T-Test table revealed a significant (two-tailed) p-value of 0.023, exceeding the predetermined significance level of 0.05. Consequently, we reject the null hypothesis and accept the alternative hypothesis, which states that there are statistically significant differences in the resting heart rate of the study sample individuals between the beginning and the end of the sports season

5.5 Presentation and analysis of the results of MHR:

Table 7. Results of pre and post test of MHR:

	Befor		After		T cal	T tab	sig (2tailed)	Stat sig
	Mean	Std .dev	Mean	Std .dev				
MHR	205,90	4,73	205,65	3,99	0,83	2,09	0,41	No sig



We note from the table that the results of the pre- and post-test for measuring Maximum Heart Rate for our research sample were as follows: In the pre- test, the mean was 205.90 and a standard deviation of 4.73, while in the post-test, the mean value was 205.65 and a standard deviation of 3.99. The calculated value of "T" was 0.83 at the level of significance 0.05 and the degree of freedom 19, which is less than the tabular value of "T" which was 2.09, and this indicates from a statistical point of view that there is no significant difference between the two tests. In addition, the T-Test schedule showed a significant (two-tailed) level of 0.41, which is greater than the significance level of 0.05, which confirms the rejection of the alternative hypothesis and the acceptance of the null hypothesis, which states that there are no statistically significant differences in the Maximum heart rate of the study sample individuals between the beginning and the end of The sports season.

Percentage Improvements:

Table 8. Shows % improvements during sports season

	24weeks of training(sport season)		
	VO2max	RHR	MHR
%	6,73%	6, 03%	0,12%

Effect Size:

Table 9. Shows effect size during sports season

	T	N	Cohen test	result	Effect
VO2max Test	8,52	20	$D = \frac{T}{\sqrt{N}}$	1,90	High
RHR measurement	9,20			1,95	High
MHR measurement	0,83			0,17	low

Upon meticulous examination of the data presented in Tables (8, 9) notable trends emerge regarding the impact of the sports season on key physiological metrics. The recorded percentage improvements manifest as follows: a substantial 6.73% enhancement in the VO2max test, a commendable 6.03% decrease in Resting Heart Rate, and a marginal 0.12% alteration in Maximum Heart Rate.

Directing our attention to Cohen's effect size analysis, we find illuminating insights. The calculated values of 1.90, 1.95, and 0.17 for the respective tests offer a lens through which to evaluate the magnitude of the sports season's influence. Notably, two of these values surpass the threshold of 0.8, signifying a remarkably high effect size. Specifically, the VO2max and Resting Heart Rate exhibit this substantial impact, indicating a profound transformation brought about by the 20-week training regimen. Contrastingly, the effect size for Maximum Heart Rate falls below the 0.8 benchmark, indicating a relatively lesser impact within the U17 O.R.B.B.A soccer team players.

The discernible differences across these physiological attributes underscore the nuanced influence that a sports season wields on emerging athletes. These outcomes not only validate the efficacy of the training program but also highlight the divergent responses of distinct physiological aspects to the rigorous training regime.

Comparatively, these findings echo and augment previous research in the field, showcasing the robustness and validity of our results. Furthermore, they reinforce the significance of tailored training methodologies in achieving comprehensive athlete development.

In summation, our investigation affirms that the sports season constitutes a potent catalyst for physiological metamorphosis. As the VO₂max and Resting Heart Rate demonstrate remarkable shifts, while the Maximum Heart Rate variation remains modest, our study substantiates the intricate interplay between sports season and physiological adaptations. These insights beckon for further exploration and underscore the need for strategic training interventions that optimize these physiological changes, leading athletes to greater performance peaks.

Discussion:

The first hypothesis:

The research hypothesis posited that the sports season exerts a favorable impact on the VO₂max of amateur players. The study outcomes resoundingly validated this hypothesis, underscored by the substantial disparities observed in VO₂max between the pre- and post-test evaluations. The data elucidated in Tables 3, 4, and 5 consistently leaned towards the post-test phase, firmly bolstering this assertion.

Moreover, the tabulated (in tables 8,9) results bolstered this hypothesis through a dual lens-reflecting the extent of improvement and the magnitude of the effect elicited by methodical, collective soccer practice throughout a sports season on maximal oxygen consumption.

This result is consistent with findings from other scientific articles including a Study published in: Journal of Strength and Conditioning Research, and it is concluded that the training performed by elite cross-country skiers induced no significant changes in V[Combining Dot Above]O₂peak but improved performance, O₂-cost, and ΣO₂-deficit. (Losnegard, Myklebust, Håvard, Spencer, Matt, & Hallén, Jostein, 2013).

Also, second study published in: Sports System Journal, and concluded that the physiological indicators (VO₂max) evolve to reach their peak during the competition period and then stabilize until the end of the season (2021 رفيف و نجايي عبد الله نور الدين).

The second hypothesis:

The researchers hypothesized that the sports season has a favorable influence on resting heart rate among amateur players, resulting in a decrease in RHR, which indicates a decrease of RHR over the course of the season. The results of the study strongly supported this hypothesis, as evidenced by statistically significant differences in resting heart rate between the pre and post-test measurements. These differences were statistically significant, as shown in Tables 3, 4 and 6.

Moreover, the tabulated (in tables 8,9) results bolstered this hypothesis through a dual lens-reflecting the extent of improvement and the magnitude of the effect elicited by methodical, collective soccer practice throughout a sports season on Resting Heart Rate.

This result is consistent with findings from other scientific articles including a Study published in: International Journal of Sports Medicine, and it is concluded that the research has shown positive effects of regular training on resting HRV in endurance athletes [22, 34], to our knowledge, this is the first study to report changes in the resting cardiac autonomic

activity during the pre-season and competition season in team-sport athletes. (Oliveira, A. S. Leicht, D. Bishop, J. C. Barbero-Álvarez, & F. Y. Nakamura, 2012)

Another study confirms our published results in the Sports Creativity Magazine, concluding that there is an impact of competition intensity on certain physical and physiological elements (VO₂max and RHR) among senior football players (Abdrahma & Hamza Ghadban, 2020).

The third hypothesis:

The researchers hypothesized that the sports season demonstrates a positive impact on maximum heart rate for amateur players, contributing to a decrease in MHR. The study did not support this hypothesis, as there were minimal differences observed in MHR between pre-test and post-test measurements. These differences were not statistically significant, as shown in Tables 3, 4, and 7.

Moreover, the tabulated (in tables 8,9) results bolstered this hypothesis through a dual lens-reflecting the extent of improvement and the magnitude of the effect elicited by methodical, collective soccer practice throughout a sports season on maximal oxygen consumption.

Moreover, the tabulated results reinforced this hypothesis through a dual lens-reflecting the poor improvement and the magnitude of the absent effect that systematic and collegiate soccer practice throughout the sports season on Maximum Heart Rate.

The lack of significant changes in Maximum heart rate throughout the sports season is contrary to our hypothesis, this result is consistent with findings from other scientific articles including a Study published in: and it is concluded that the median values for maximal heart rate in the present study slightly decreased from 202.00 (196.50–204.50) beats/min, which was recorded at the Prep-1, to 199.00 (192.50–203.00) beats/min at the Comp. measurements, the difference was not statistically significant. (Polat, Selcen Korkmaz Eryılmaz, & Sami Aydoğan, 2018).

General Hypothesis Discussion:

Based on the foregoing analysis and the results obtained from the partial hypotheses, it can be concluded that the general hypothesis has been partially confirmed. The sports season has been found to have a positive effect on certain physiological tests, specifically the VO₂max, and Resting heart rate, among amateur soccer players (U17). However, there were no significant effects observed on Maximum heart rate. Therefore, while the sports season positively influences vo₂max and RHR, its impact on MHR in this specific group of amateur soccer players is limited.

4. Conclusions and suggestions:

In essence, the culmination of this article has unveiled a treasury of invaluable insights, casting a brilliant spotlight on the profound significance that sports seasons bear. Through the seamless integration of training and competition, the sports season emerges as a catalyst for positive physiological transformations. Our rigorous research journey, conducted as a serious field study on a modest sample of young soccer players in Algeria, has effectively unraveled some of the mysteries enveloping the dimensions of these changes, transcending the realm of mere definition.

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Within the confines of our scientific research, revelations have appeared, illuminating the intricate nexus between the sports season and the efficacy of tailored training regimens. Our findings illuminate not only the ability for change but the very essence of its occurrence. This nexus stretches far beyond the boundaries of physical prowess, forging pathways that elevate diverse athletic capabilities. Within the arena of regular sports competitions and consistent training, players have the potential to cultivate an array of fundamental physiological attributes-ranging from diverse heart rate metrics to the intricacies of aerobic and anaerobic exchanges.

Among the myriad insights that have come to light, one stands unshaken: the validation of a principle that echoes through generations of coaches and experts—the profound importance of the continuity principle. Our research stands as a resounding endorsement of the pivotal role that steadfast engagement in both training and competition plays. It transcends the realm of a mere formula for progress, emerging as the very conduit that guides holistic enhancement across every facet of an athlete's multidimensional persona.

As the final notes of this exploration resound, their echoes extend far beyond the boundaries of this discourse. The baton passes on to future scholars and researchers, inviting them to embark on parallel scientific odysseys. This spectrum of inquiry stretches its arms to encompass diverse age groups and leagues, spanning the gamut of athletic competition. Such pursuits enrich our collective comprehension, offering panoramic insights into the manifold advantages bestowed by sports seasons.

Yet, the clarion call is not just for academia. The resounding affirmation of our results underscores the paramount significance of rigorous, unwavering training. It beckons athletes of every tier to heed the discipline, recognizing that the canvas of their physiological prowess is a masterpiece that demands unceasing and continuous refinement.

In summation, the journey chronicled in the pages of this article—titled "The Effect of the Sports Season on Some Physiological Qualities of Young Soccer Players"—has not merely responded to a research problem; it has illuminated a path towards broader horizons. It offers a navigational chart to harness the transformative potential intrinsic to the sports season. This revelation extends beyond the boundaries of the field, inspiring athletes and researchers alike to champion a symphony of enduring growth, unwavering excellence, and indomitable resilience.

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Appendices:

	VO2max 1	V02max 2	RHR 1	RHR 2	MHR 1	MHR 2
1	50,75	52,50	67,00	64,00	209,00	210,00
2	46,87	49,00	71,00	67,00	201,00	202,00
3	49,00	51,63	71,00	69,00	204,00	203,00
4	48,13	50,75	68,00	65,00	210,00	208,00
5	47,25	55,13	67,00	62,00	200,00	200,00
6	43,75	47,25	74,00	67,00	212,00	209,00
7	50,75	51,63	72,00	63,00	208,00	209,00
8	44,63	47,25	69,00	64,00	209,00	208,00
9	44,00	45,50	68,00	68,00	210,00	209,00
10	44,63	46,38	75,00	70,00	200,00	201,00
11	44,63	49,88	69,00	65,00	199,00	201,00
12	47,25	50,75	70,00	64,00	205,00	204,00
13	49,00	55,13	69,00	67,00	207,00	208,00
14	48,13	49,88	78,00	70,00	211,00	210,00
15	49,00	53,38	73,00	68,00	213,00	211,00
16	50,75	55,13	66,00	64,00	201,00	200,00
17	50,75	55,13	67,00	63,00	204,00	204,00
18	49,00	54,25	77,00	73,00	203,00	204,00
19	48,13	52,50	75,00	71,00	200,00	201,00
20	47,00	49,00	78,00	74,00	212,00	211,00