Contents lists available at ASJP (Algerian Scientific Journal Platform)

Academic Review of social and human studies

journal homepage: www.asjp.cerist.dz/en/PresentationRevue/552

Seasonal changes in some physical characteristics of young soccer players during a sports season

التغيرات الموسمية في بعض الخصائص البدنية للاعبي كرة القدم الشبان خلال موسم رياضي

Kedjadja Salim [1, *], Himoud Ahmed [2],

[1] University of Constantine 2 (Sports Performance Expertise and Analysis Laboratory), Algeria.

[2] University of Constantine 2 (Sports Performance Expertise and Analysis Laboratory), Algeria.

Article info:

Article history:

Received :10-09-2023

Accepted : 12-12-2023

Key words:

Sports Season

Strength endurance

Agility

Aerobic Endurance.

Abstract

The study aims to provide continuous monitoring of the various physical characteristics under study, namely strength endurance, agility, and aerobic endurance, throughout the 2022-2023 sports season. The study was conducted on a research sample consisting of 20 players from the Olympic team, Boumahra Ahmed under 17, who is active in the Annaba regional league. The researcher used the descriptive approach and conducted physical tests, including the Wall Sit test, Agility T test, and YOYO test, at four different time points during the season. Data analysis was performed using the SPSS statistical software. The results revealed a significant improvement in strength endurance, agility and aerobic endurance among soccer players throughout the sports season. By monitoring these physical qualities, coaches can tailor training programs more effectively, thus empowering athletes to reach their maximum potential on the field, while also contributing to the broader body of knowledge in sports science and coaching methodologies.

الكلمات المفتاحية:

الموسم الرياضي

تحمل القوة

الرشاقة

التحمل الهوائي.

ملخص

تهدف الدراسة إلى توفير مراقبة مستمرة لبعض الخصائص البدنية المختلفة قيد الدراسة، وهي قوة التحمل، والرشاقة، والتحمل الهوائي، و ذلك طوال الموسم الرياضي 2022-2023. حيث أجريت الدراسة على عينة بحث مكونة من 20 لاعبا من لاعبي الفريق الأولمبي لبلدية بومهرة أحمد تحت 17 سنة الناشط في الدوري الجهوي لرابطة عنابة. واستخدم الباحث المنهج الوصفي باعتباره مناسب لطبيعة البحث، وأجرى اختبارات بدنية مناسبة ، تمثلت في اختبار Wall Sit، واختبار الرشاقة T، واختبار YOYOالمستوى الاول، و ذلك في أربع نقاط زمنية مختلفة خلال الموسم. بعد جمع كافة البيانات اللازمة تم إجراء تحليل لها باستخدام البرنامج الإحصائي SPSS. وأظهرت النتائج تحسنا ملحوظا في قوة التحمل والرشاقة والتحمل الهوائي لدى لاعبي كرة القدم طوال الموسم الرياضي. من خلال مراقبة هذه الصفات البدنية، يمكن للمدربين تصميم برامج تدريبية بشكل أكثر فعالية، وبالتالي تمكين الرياضيين من الوصول إلى أقصى إمكاناتهم في الملعب، مع المساهمة أيضًا في مجموعة أوسع من المعرفة في علوم الرياضة ومنهجيات التدريب.

* Corresponding author at: University of Constantine 2, Algeria.
Email : k.salim@univ-constantine2.dz

1. Introduction

Football is a team sport in which fitness plays an important role in the performance and level of players whether professional or amateur. Monitoring seasonal changes to various fitness components provides valuable insights into athletes 'preparedness to train or compete and helps them mitigate injury risks. Therefore, understanding these changes during the stages of the season is crucial for both athlete and coach. "Physical tests, performed regularly, become a valuable tool for monitoring and controlling training, as they are likely to detect improvements or decreases in physical condition."(C.DATH, 1991).

Assessing the burden of training and conducting sports fitness tests is vital for assessing players' preparedness throughout the season. In football, there are many physical features necessary for footballers, endurance, strength endurance and Agility are key elements of particular importance and need constant work to develop them. "Football is a sport with high intensity intermittent efforts, hence the importance of aerobic and anaerobic endurance and explosive speed." (dellal & al, 2008, p. 4), making systematic measurement and follow-up essential for assessing players' willingness to train and compete and helping to detect problems such as overtraining or reducing training, allowing appropriate adjustments to individual or collective training loads.

Physical tests are commonly used in football and other sports to assess players' optimal physical features. Monitoring these features periodically throughout the season provides valuable data on the effects of training and competition on athletes' willingness to train "The assessment of footballers from an early age, during exploration sessions, is carried out through physiological tests that are often medical. Many investigations can be carried out depending on the energy sector, these different assessments aim to track the development of players throughout their careers and possibly determine their sporting levels». (Dauty & M Potiron Josse, 2004)

Numerous scientific studies have highlighted dynamic changes in various physiological and physical characteristics across different age groups and time periods, most of which have focused on careful periodic follow-up throughout the season, especially during preparation periods and competition. This type of research is still rare and little at the level of our National Championships, which created a significant research gap in collecting and analyzing data between Algerian league both amateur and professional championships and others leagues, Through this study, we aim to address this research gap by investigating the correlations between changes in physical traits during a full sports season for amateur footballers under the age of 17, and gain comprehensive insights into the dynamic changes in physical attributes during a sports season.

For that, we asked the following general question arises: are there changes in physical characteristics of soccer player's during a sports season?

Partial questions:

- What are the changes observed in strength endurance during a sports season?

- What are the changes observed in the agility during a sports season?

- What are the changes observed in the aerobic endurance during a full sports season?

General hypothesis: We assume that there are positives changes in some physical characteristics of football players during a full sports season.

Partial hypotheses:

- We assume an improvement in the strength endurance of soccer players during a sports season.

- We assume an improvement in the agility of football players during a sports season.

- We assume an improvement in the aerobic endurance of football players during a sports season.

2. Aims of the study:

- The level of changes in some physical qualities of U17 football players during a full competitive season.

- The importance of regular monitoring and assessment of physical qualities of young football players to determine their level of development.

The impact of a sports season on the physical changes of football players U17.

- The pattern of physical changes that occur in the endurance, explosive strength, and speed traits of young football players throughout a full sports season.

2.1 terms definition:

Physical qualities: "Physical qualities refer to the underlying physical and physiological characteristics that enable athletes to perform sports skills. Examples of physical qualities include maximal strength, speed, power, agility, flexibility, and endurance" (Baechle, 2008, p. 19).

Strength endurance:"According to Harre (1976), it is the body's ability to resist fatigue for long-term effort.

According to Neumann (1986), strength endurance capacities should above all aim at adapting the strength potential of slow or fast twitch muscle fibers operating in the oxidative mode". (Weineck, 1997, p. 181)

- Agility: "Agility is the ability to change body positions, speed, or direction on the ground or in the air with precision, fluidity, and correct timing." (حماد، 2008،صفخة 199)

Endurance:

Weineck (1992) a defined it as: "the mental and physical ability of the athlete to resist fatigue" (didier-riess & pascal, 2013, p. 116)

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"

2.2 Previous studies:

-Study of Olivier Maurelli (2018) entitled "Effects of a competitive season on the muscular, biological and psychological characteristics of international-level handball players » wish is a PH thesis, from Picardie Jules Verne university, it is aimed to: analyze the influence of a sports season on the physical, physiological and psychological characteristics of handball players from the Montpellier Agglomeration Handball club. This research highlights the need to develop strength and power qualities as efficiently as possible during Pc2P and to target the most relevant markers for longitudinal tracking of handball players.

- Study of Suleiman Hafid Alaamed (2009) entitled "The Effect of Competition Period upon Physical and Skill Abilities of Football Players in the West Ban" wish is a PH thesis, The study aimed to know the effect of the competition period on some of the physical and skillful abilities of football players. The sample included 30 players. The descriptive approach was used. The researcher concluded that there is no training strategy that takes into account the different season periods.

3. The practical chapter:

-Adopted Approach: The descriptive Approach was used in this study, as it was considered appropriate to address the research topic.

- The 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 the football teams that are actively playing in the Regional-league of ANNABA (U17), during the season 2022/2023. The total number of teams in this community was 12 (280 players).

- The Sample: our study was based on a sample of 20 soccer players from Olympic Riadhy of Boumahra Ahmed football team (O.R.B.B.A), under 17 years old.

Table 1.

Characteristics of the Sample:

	Age(years)	*Weight(kg)*	*Height(cm)*	*Season(weeks)*
N	*16± 0,5*	*62± 2*	*156± 12*	*24*

Variables:

Independent variable: Full sport season.

Dependent variable: some physical qualities.

Areas of study:

Special field: ORBBA stadium.

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

Human field: 20 soccer players (under17)

Data collection tools:

- Strength endurance: **Wall Sit Test**:

Purpose: to measure the strength endurance of the lower body, particularly the strength of your quads, hamstrings and glutes.

Equipment required: flat non-slip floor, smooth wall and a stopwatch.

Pre-test: Explain the test procedures to the subject. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such as age, height, body weight, gender, test conditions. Perform an appropriate warm-up (leg stretches, squats).

Wall squat test position Procedure:

Stand comfortably with feet shoulder width apart and about 2 feet from the wall, with your back against a smooth vertical wall. Slowly slide your back down the wall to assume a position with both your knees and hips at a 90° angle. Move the feet distance from the wall if required. Ensure that the feet are flat on the ground, the back flat against the wall, and the knees and hips are at right angles. The knees should be directly above your ankles (rather than over your toes), and the thighs paraeele to the ground. The timing starts when the correct position is assumed, and is stopped when the subject cannot maintain that position.

Scoring: record the total time in seconds that the position was held. (Wood, Wall Squat Test, 2022).

- Agility test: T-Test

Purpose: the T-Test is a test of agility for athletes, and includes forward, lateral, and backwards running.

Pre-test: Explain the test procedures to the subject. Perform screening of health risks and obtain informed consent. Prepare forms and record basic information such as age, height, body weight, gender, test conditions. Measure and mark out

Test setup: Set out four cones as illustrated in the diagram above (5 yards = 4.57 m, 10 yards = 9.14 m).

Procedure: The subject starts at cone A. On the command of the timer, the subject sprints to cone B and touches the base of the cone with their right hand. They then turn left and shuffle sideways to cone C, and also touches its base, this time with their left hand. Then shuffling sideways to the right to cone D and touching the base with the right hand. They then shuffle back to cone B touching with the left hand, and run backwards to cone A. The stopwatch is stopped as they pass cone A.

Scoring: The trial will not be counted if the subject crosses one foot in front of the other while shuffling, fails to touch the base of the cones, or fails to face forward throughout the test. Take the best time of three successful trials to the nearest 0.1 seconds. (Wood, 2008)

- Aerobic Endurance: The Yo-Yo Intermittent Endurance Test Level 1:

Equipment Required: flat non-slip surface, marking cones, measuring tape, cd or mp3 player with good speakers

Starting the Test: All participants should line up along the starting line. The athletes start with a foot behind the middle line (cone B), and begin running when instructed by the audio recording. The athlete turns when signaled by the recorded audio beep (at cone C), and returns to the starting point. The athlete must not start running early, must run the complete distance, and reach each line before or in time with the recording. (Wood, 2018)

Table 2.

Shows the times of the different tests:

	Sports season	**Date**
Test 1	Week 1	25/10/2022
Test 2	Week 8	25/12/2022
Test 3	Week 16	25/02/2023
Test 4	Week 24	27/04/2023

Scientific conditions of the tools:

The researcher reached the validity of the test based on the stability coefficient and calculated the validity coefficient from the following equation:

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

Table 3.

Results of stability and reliability coefficient

Test	Wall sit Test	Agility test	Yo-yo Test
Stability Coefficient	0,83	0,97	0,98
Validity Coefficient	0,91	0,98	0,98

It is clear from the table that all the values of the correlation coefficients are close to 1, meaning that the stability coefficient is strong and the degree of validity is high, and this indicates the validity and the stability of the used tests.

Statistics tools:

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

- Repeated measures ANOVA:

This particular test requires one independent variable and one dependent variable. The dependent variable must be a continuous (interval or ratio) and a categorical independent variable (either nominal or ordinal). (Laerd.com, 2018). "This design is also known as time series design and Similar to repeated measures design. Where each topic is tested iteratively under different processing conditions" (Verma., 2016, p. 73)

Exposure, analyses and result exam :

-The normal distribution of the data:

Table 4.

Result of different normal distribution tests:

	Sig Sw(WS)	Sig Sw(agility T)	Sig Sw(v.m.a)	Sig	Ddl	Result
T1	0,225	0,327	0,142	0,05	20	Normal D
T2	0,380	0,205	0,141			
T3	0,240	0,330	0,265			
T4	0170	0,278	0,237			

Table 4 presents the results of the Shapiro-Wilk test for the three tests conducted at 4 times during season. The reported p-values are all greater than the assumed significance level of 0.05, we conclude that the data are **normally** distributed.

***) Presentation and analysis of the results of strength endurance test:**

1) ANOVA repeated measures test and assumption of sphericity:

Table 5.

Result of Mauchly's test of sphericity.

	Sig (spher)	Sig	Result
Mauchly's test	0,00	0,05	Sphericity not assumed

Reviewing Table (11), we observe that the calculated significance level for the sphericity test is 0.00, indicating a substantial deviation from the assumed significance level of 0.05. This pronounced difference underscores a definite violation of the sphericity assumption.

Table 6.

Statistical significance of Wall Sit test.

		W.S.T
Test1	**Mean**	35,95
Test2	**Mean**	43,30
Test3	**Mean**	49,70
test4	**Mean**	58,15
ddl		5
(H.F). F		0,632
Sig F		0,00
Sig		0,05
Result		Sig

Given that the assumption of sphericity was not met, we employed the Huynh-Feldt correction test. So from Table (12), we observed that the significance level for the Huynh-Feldt test is 0.00, which is below the predetermined significance level of 0.05. As a result, we reject the null hypothesis and accept the alternative hypothesis, indicating the presence of significant differences among the wall sit tests conducted during the sports season.

2) Pair wise comparisons:

Table 7.

Comparison of different tests:

	Mean. Def	sig	sig	Result
1 2	7,35	0,00	0,05	Sig
1 3	13,75	0,00		Sig
1 4	22,20	0,00		Sig
2 3	6,40	0,00		Sig
2 4	14,85	0,00		Sig
3 4	8,45	0,00		Sig

To examine specific differences among the four measurements of the Wall Sit test, we conducted pairwise comparisons using the Bovroni test. Analysis of Table (13) reveals that the level of statistical significance for the comparison between the first and second measurements, estimated at 0.00, exceeds the predetermined significance level of 0.05. Consequently, we can deduce that there are a significant differences between the results of the wall sit test for the first and second measurements. Also, all the remaining significance level values (0.00. 0.00. 0.00. 0.00. 0.00) are below 0.05, indicating significant differences among the three subsequent measurements. Hence, we can confidently conclude that there are significant variations in vertical jump performance across the different measurements taken during the sports season, with the exception of the initial measurement.

Based on the obtained results, it can be confidently concluded that there exist significant disparities in the wall sit test across the entire sports season. Remarkably, the fourth (post) test results exhibited a substantial improvement when compared to the first (pre) test outcomes among the group of players under examination. This disparity highlights the notable progress achieved in aerobic endurance performance over the course of the sports season.

*** Presentation and analysis of the results of the Agility T test:**

1) ANOVA repeated measures test and assumption of sphericity:

Table 8.

Result of Mauchly's test of sphericity.

	Sig (spher)	Sig	Result
Mauchly's test	0,00	0,05	Sphericity not assumed

From Table (8), it is evident that the calculated significance level for the sphericity test is 0.00, which is below the assumed significance level of 0.05. This significant difference indicates a clear violation of the sphericity assumption.

Table 9.

Statistical significance of agility test.

		Agility
Test1	**Mean**	10,0
Test2	**Mean**	9,88
Test3	**Mean**	9,63
test4	**Mean**	9,58
ddl		1,06
H.F). F)		10,88
Sig F		0,00
Sig		0,05
Result		Sig

Given that the assumption of sphericity was not met, we employed the Huynh-Feldt test. Upon examining Table (10), we observed that the significance level for the Huynh-Feldt test is 0.00, which is below the predetermined significance level of 0.05. Consequently, we reject the null hypothesis and accept the alternative hypothesis, indicating the presence of significant differences among the agility tests conducted during the sports season.

2) Pair wise comparisons:

Table 10.

Comparison of different tests.

	Mean. Def	sig	sig	result
1 2	0,141	0,002	0,05	Sig
1 3	0,389	0,028		Sig
1 4	0,448	0,012		Sig
2 3	0,257	0,027		Sig
2 4	0,307	0,081		Sig
3 4	0,050	0,011		Sig

To assess specific differences among the four measurements of the Agility T test, we conducted pairwise comparisons using the Bovroni test. The table (10) reveals that the level of statistical significance between the first and second measurements, estimated at 0.002, is lower than the assumed significance level of 0.05. Therefore, we can conclude that there are significant differences between the results of the agility test between the first and second measurements. Also, the remaining significance level values (0.02, 0.02, 0.08, and 0.01) are all less than 0.05, indicating significant differences between the three subsequent measurements. Consequently, we can confidently conclude that there are significant differences in agility across different phases of the sports season.

Based on the findings, we can confidently conclude that there are significant differences in the Agility T test throughout the sports season. Notably, the results of the fourth (post) test showed a noteworthy improvement compared to the results of the first (pre) tests for the group of players under study.

*** Presentation and Analysis of Results of aerobic endurance test:**

1) ANOVA repeated measures test and assumption of sphericity:

Table 11.

Result of Mauchly's test of sphericity

	Sig (spher)	Sig	Result
Mauchly's test	0,00	0,05	Sphericity not assumed

The Table 5 shows that the significance level calculated for the sphericity is 0.0, which is less than 5%, this indicates a clear violation of the sphericity assumption

Table 12.

Statistical significance of YO-YO test:

		Yoyo test
Test1	**Mean**	13,48
Test2	**Mean**	14,13
Test3	**Mean**	14,43
test4	**Mean**	14,60
ddl		1,246
(H.F). F		76,06
Sig F		0,00
Sig		0,05
Result		Sig

Since the assumption of sphericity was not fulfilled, we used the Huynh-Feldt test. Referring to Table (6), the value of the significance level for the Huynh-Feldt test is 0.00, lower than the assumed significance level of 0.05. As a result, we reject the null hypothesis and accept the alternative hypothesis, which indicates significant differences between the four yo-yo tests.

2) Pair wise comparisons:

Table 13.

Comparison of different tests:

	Mean. Def	sig	sig	result
1 2	0,650	0,00	0,05	Sig
1 3	0,950	0,00		Sig
1 4	1,113	0,00		Sig
2 3	0,300	0,00		Sig
2 4	0,463	0,00		Sig
3 4	0,163	0,02		Sig

To evaluate specific differences between the four measurements of the yo-yo test, we performed pairwise comparisons using the Bovroni test. Table (7) shows that all significance level values are less than 0.05, indicating that there are significant differences between the four measurements. Thus, we can confidently conclude that there are significant differences in aerobic endurance across different phases of the sports season.

Based on the findings, we can conclude that there are significant differences in the maximum aerobic speed test throughout the sports season. Specifically, the results of the fourth (post- test) demonstrated a notable improvement compared to the results of the first (pre-test), with intermediate results observed in the second and third tests for the group of players under study.

4. Results and discussion

The first hypothesis: We set out to examine whether there would be an improvement in the strength endurance of soccer players over the course of an entire competitive season. The results of our study strongly confirm the validity of this hypothesis, as we noticed that there were statistically significant differences in force tolerance across the four measurement points for

the same group of players. These notable differences are prominently displayed in Tables 4, 5, 6 and 7.

This result is consistent with findings from other scientific articles and doctoral theses including a Study published in: Journal of Strength and Conditioning Research, and it is concluded that the results showed significantly better ventral Bourban and T-Test performances (d = 1.28–2.28; p = 0.000–0.001) compared with PT (Lesinski, et al., 2021).

Second hypothesis: The results of our study provide compelling evidence supporting our hypothesis. We noticed statistically significant differences in agility across the four measurement points for the same group of players, as clearly indicated in Tables 4, 8, 9 and 10.

Based on the comprehensive analysis of our study's results, we confidently affirm the validity of our hypothesis. Our findings underscore the significant impact of training load and increased competitions throughout the sports season, which directly contributed to the development and enhancement of agility among soccer players under 17.

This result is consistent with findings from other scientific articles and doctoral theses including a Study published in: sports journal, and it is concluded that the performance of speed and the ability to quickly change direction of the players improved throughout the observation period. (Dragijsky, & al, 2017)

Third hypothesis: We set out to examine whether there would be an enhancement in the aerobic endurance of soccer players throughout a complete competitive season. The outcomes of our study strongly validate this hypothesis, as we observed statistically significant disparities in aerobic endurance across the four measurement time points for the same group of players. These notable differences are prominently displayed in Tables 4, 11, 12 and 13.

This result is consistent with findings from other scientific articles and doctoral theses including a Study published in: journal of Sports Sciences, and it is concluded that the results demonstrate that soccer-training season was able to provide maturation free improvement in physical characteristics in young soccer players during the training season (HAMMAMI & al, 2012).

General Hypothesis Discussion

Through the above and the results of the partial hypotheses, we can confirm that the general hypothesis has been achieved, and that there are positives changes in some physical qualities of soccer players during a full sport season.

5. Conclusion

This study explored the dynamic changes in strength endurance, agility, and aerobic endurance among young soccer players during a sports season. By conducting physical exams over multiple periods, significant improvements in these physical attributes have been observed among players of the football team. These findings highlight the potential for performance improvement and suggest the effectiveness of training strategies in developing key physical traits in young athletes, based on what we have found we can make the following recommendations:

Regular assessments of studied physical qualities provide valuable insights into the effectiveness of training programs and allow timely adjustments to be made to improve performance.

- Identifying individual strengths and weaknesses of players will enable coaches to focus on improving areas that require attention, leading to more well-rounded and efficient development of physical attributes.

- Adopt a long-term player development approach, focusing on gradual and sustainable improvement rather than short-term gains. Consistent training and monitoring over several seasons can lead to significant and lasting performance enhancements.

- The need to conduct further research for longer periods of time and on different age groups to obtain an accurate and practical follow-up of the change and improvement of physical characteristics with the passage of sports seasons.

Conflict of interest

Authors Kedjadja Salim, Himoud Ahmed declares that they have no conflict of interest.

- References

In English

Baechle, R. T. (2008). Essentials of Strength Training and Conditioning, 4th edition. Champaign, Illinois: Human Kinetics.

C.DATH. (1991). Medicine d'Afrique Noire. Assessment of Physical Fitness. Interest, Methods and Practical application, p. 681-687.

Dauty, &£M Potiron Josse. (2004, 04).Science &Sports. Correlations and differences of performance between soccer players, professionals, young players and amateurs, from the 10 meter sprint test and knee isokinetic assessment, p.75-79.

Dragijsky, M., Tomas Maly, Frantisek Zahalka, Egon Kunzmann, & Mikulas Hank. (2017, 02 04). Sports journal. Seasonal Variation of Agility, Speed and Endurance Performance in Young Elite Soccer Players, pp. 01-08.

Gravetter, F. J., & Wallnau, L. B. (2014). Gravetter, F. J., & Wallnau, L. B. Essentials of statistics for the behavioral sciences (8th ed.). Wadsworth Cengage Learning. Boston: Wadsworth Cengage Learning.

Lesinski, Melanie, Prieske, Olaf, Chaabene, Helmi, Urs. (2021, 12). Journal of Strength and Conditioning Research. Seasonal Effects of Strength Endurance vs. Power Training in Young Female Soccer Athletes, pp. 90-96.

Nestor, P. G., & Russell K. (2009). Research Methods in Psychology, 3rd edition. California: SAGE Publications, Inc.

Verma, J, P. (2016). Repeated Measures Design for Empirical researchers, first edition. Gwalior. India: john Wiley and sons.

Laerd.com. (2018). Retrieved from Laerd Statistics: SPSS Statistics Tutorials and Statistical Guides: https://statistics.laerd.com/statistical-guides/repeated-measures-anova-statistical-guide.php

Wood, R. (2018). The complete guide to the yoyo test. Retrieved from All about the Yo-Yo Intermittent Endurance Test Level https://www.theyoyotest.com/yyie1.htm

Wood, R. (2008, 2 12). https: //www.topendsports.com/testing/tests/t-test.htm. Retrieved from Topend Sports: https: //www.topendsports.com/testing/tests/t-test.htm

Wood, R. (2022, 05 1). Wall Squat Test. Retrieved from Topend Sports:

https: //www.topendsports.com/testing/tests/wall-squat.htm

In French

Dellal, a, & al. (2008). De l'entrainement a la performance en football. Paris : bibliothèque nationale.

didier-riess, & pascal, p. (2013). La bible de la préparation physique. Paris: amphora

Mohamed Ali Hammami, & al. (2012, April 5). Effects of a soccer season on anthropometric characteristics and physical fitness in elite young soccer players. Journal of Sports Sciences, pp. 588-596.

Weineck, j. (1997). Manuel d'entrainement. Paris: vigot.

In Arabic

السيد ابو عبدة حسن. (2001). الاتجاهات الحديثة في تخطيط و تدريب كرة القدم. الاسكندرية: مكتبة الاشعاع.

مفتي ابراهيم حماد. (2008). التدريب الرياضي الحديث، ط2. القاهرة: دار الفكر العربي.

List of annexes

Table 14

Strength endurance results

	T1	T2	T3	T4
1	30,00	35,00	41,00	52,00
2	29,00	37,00	44,00	47,00
3	30,00	40,00	41,00	49,00
4	40,00	43,00	45,00	53,00
5	35,00	44,00	46,00	53,00
6	34,00	43,00	52,00	55,00
7	36,00	46,00	51,00	54,00
8	39,00	49,00	49,00	56,00
9	34,00	43,00	46,00	49,00
10	35,00	44,00	55,00	60,00
11	41,00	42,00	44,00	56,00
12	41,00	47,00	52,00	63,00
13	38,00	46,00	52,00	65,00
14	33,00	42,00	57,00	68,00
15	34,00	43,00	55,00	66,00
16	37,00	48,00	50,00	60,00
17	31,00	38,00	47,00	58,00
18	41,00	48,00	56,00	66,00
19	39,00	46,00	57,00	67,00
20	42,00	42,00	54,00	66,00

Table 15

Agility results:

	T1	T2	T3	T4
1	11,33	10,55	10,45	10,41
2	12,53	11,53	10,47	10,44
3	11,30	11,30	10,26	10,25
4	10,28	10,28	10,20	10,15
5	10,56	9,56	9,35	9,28
6	9,53	9,53	9,50	9,48
7	10,84	10,84	10,72	10,65
8	9,49	9,48	9,43	9,41
9	9,31	9,31	8,78	8,55
10	9,66	9,65	9,49	9,45
11	8,66	8,65	8,47	8,40
12	9,41	9,41	9,37	9,35
13	10,34	10,34	10,31	10,28
14	9,54	9,53	9,44	9,39
15	8,47	8,48	8,32	8,25
16	10,31	10,30	10,21	10,16
17	9,25	9,25	9,22	9,22
18	8,50	8,49	8,41	8,31
19	11,69	11,69	11,66	11,65
20	9,58	9,58	8,56	8,54

Table 16

Aerobic Endurance results:

	T1	T2	T3	T4
1	14,50	15	15	15
2	12,25	13,50	13,75	14
3	14	14,50	14,75	14,75
4	13,75	14	14,25	14,50
5	13,50	14,50	15,25	15,75
6	12,50	13	13,25	13,50
7	14,50	14,75	14,75	14,75
8	12,75	13	13,25	13,50
9	12	12,75	13	13
10	12,75	13	13	13,25
11	12,75	13,75	14	14,25
12	13,50	14,25	14,50	14,50
13	14	15	15,50	15,75
14	13,75	14	14,25	14,25
15	12	14,25	14,75	15,25
16	14,50	15	15,50	15,75
17	14,50	15,25	15,75	15,75
18	14	14,75	15,25	15,5
19	13,75	14,75	15	15
20	12	13,75	14	14

How to cite this article according to the APA method

Kedjadja S, Himoud A, (2024), Seasonal changes in some physical characteristics of young soccer players during a sports season, academic review of social and human studies, vol 16, number 01, Hassiba Ben Bouali University of Chlef, Algeria, pages: 164-173