SUSTAINABILITY & SPORTS SCIENCE JOURNAL

ORIGINAL ARTICLE

Quantitative estimation of the coefficient of variation for explosive force tests using Myotest and Sergeant Test: Field study on M'sila football teams "*less than 17 years old*"

Bacem Khodja. *Institute of Science and Techniques of Physical and Sports Activities. M'sila University. Algeria. Laboratory of Science and Techniques of Physical and Sports Activities. Algiers 3 University. Algeria.*
Tahar Briki. *Institute of Science and Techniques of Physical and Sports Activities. M'sila University. Algeria. Laboratory of Science and Techniques of Physical and Sports Activities. Algiers 3 University. Algeria.*
Ahmed Hamza Ghadbane . *Institute of Science and Techniques of Physical and Sports Activities. M'sila University. Algeria. Laboratory of Science and Techniques of Physical and Sports Activities. Algiers 3 University. Algeria.*

ABSTRACT

This study aims to quantify The Coefficient of Variation to test the explosive force of footballers' lower extremities using MYOTEST and Sargent test. Tests and measures are considered to be as major parts to take the right scientific decisions in the training process like diagnosis, evaluation, orientation and selection. To complete the study, the researcher used the descriptive method by applying the explosive force test for the lower extremities using the MYOTEST Device (Saut puissance), (Saut détente) and the classic method (Sargent Test) on a sample group of 33 players from M'sila football teams (MCM and WRM) and the study results were as follows: Dispersion in modern tests is less than in traditional tests; The use of modern technologies is more effective in evaluating explosive force of footballers' lower extremities in terms of coefficients of variation in comparison with traditional tests; The main difference between them is in the classification of normative levels of explosive force according to dispersion and uncertainty ratios.
Keywords: Technology, Innovation, Modern technologies, Explosive force, Test.

Cite this article as:
Khodja, B., Briki, T., & Ghadbane, A. H. (2025). Quantitative estimation of the coefficient of variation for explosive force tests using Myotest and Sergeant Test: Field study on M'sila football teams "*less than 17 years old*". *Sustainability and Sports Science Journal*, *3*(1), 22-33. https://doi.org/10.55860/YPKU3015

Corresponding author. *Institute of Science and Techniques of Physical and Sports Activities. M'sila University. Algeria.*
E-mail: ghadbane.ahmed@univ-alger3.dz
Submitted for publication July 23, 2024.
Accepted for publication December 06, 2024.
Published December 16, 2024.
Sustainability and Sports Science Journal. ISSN 2990-2975.

Identifier: https://doi.org/10.55860/YPKU3015

INTRODUCTION

The interest and participation in sports globally have increased significantly. Advances in technology have played a key role in the growth of the sports industry, which now enjoys gross sales over $800 billion annually. The sporting goods industry has diversified and expanded, incorporating the different interests and needs of the athletes and consumers. Sport and technology today have become inseparable as the transfer and integration of knowledge from a wide range of disciplines and industries has generated a rapid technological change (Subic, et al., 2011).

Today, professional sports are characterized by the search for new paths concerning how an athlete or a team may apply new technologies and sports performance data to gain the cutting edge competitive ability that will elevate them to the top of the podium or to win major league or championship titles. Therefore, professional sports properties are left with massive data pools that (without giving away competitive sporting advantages) can be utilized to assist athletes and teams in monetizing on their relationships with commercial stakeholders. In reflections over why the application of technology and data is important in sports, there are clear benefits in terms of optimizing decision-making processes on and off the playing field and thus sporting quality. William Spearman notes that "*It's been a way for intelligent teams to gain a competitive Advantage to be able to use perhaps less money, less resources but still have a competitive team*."(Cortsen, & Rascher, 2018).

The field of sports is experiencing a very dynamic and intensive development, so the application of information technology is an important factor in its successful functioning. The main factor in the popularization of sports are modern technologies and the opportunities they provide to users. The development of modern technology has resulted in better conditions for both spectators and competitors. Through the development of new technologies, much has been done to improve the results, such as those visible in tennis, athletics and the like. Modern materials are used in the production of synthetic sports surfaces in athletics, so there is a great progress in the 100-meter race compared to the time when these races took place on clay, as well as sports equipment in the form of jerseys and shoes. Sports technologies have evolved for human needs and goals. Technology in sports are also technical means by which athletes try to improve their sports result (Viduka, et al., 2021).

Today's sport world is becoming technologically advanced by combining natural athletic talent with advanced analytics and artificial intelligent to produce the best possible sporting outcomes. In so many ways, modern technology simplifies life and everyone defines technology in their own way. Throughout today's environment, where just about anything is more comfortable and available because of technical advancements in nearly every area of lifestyle. Everything in the world has both positive and negative impacts on both the living and society. In the 21st century, more people participate in sports than ever before. The previous U.N Secretary-General Kofi Annan said sport has become essentially a common language, putting citizens together irrespective of their roots, history, religious values or economic status.

Actually, sports make friendship each other and bonding each other not only for one country but also for whole world. Due to the demands of sports performance from spectator, the technological devises now take significant role. The difference between winning and losing games is often found in many sports and games, and in step-by-step team moves. As the sports industry's audience has grown alongside popularity, demand for research has increased. This is now above sports and gaming and now a billion dollar business. Researchers Roy et al. (2017) argued that in many aspects, new technology simplifies existence and each describes technology in their own way. In today's world, just about everything is more convenient and accessible because of technological advances across almost every aspect of lifestyle. Most people's lives have been enhanced and simplified by the latest technological developments. Although the real nature of sport resides in the skill of talented athletes, their performance can be dramatically improved by incorporating advanced technologies, guaranteeing competitive play and successful outcomes. Therefore, technology has the enormous capacity to improve performance and reduce the sports injury. In addition, it's unbelievable how technology has impacted sport. Using wearable technology, big data analytics, social media, and sensor technology has revolutionized the way sports are played, analysed, and enhanced in today's connected world. Pro athletes can gain more insight into their performance, improve training methods and raise their skills through various modern advances and apps (Sanjib Kumar Dey 2020).

Advances in technology have had a profound impact on sport including:

- Analysis of sport performance and enabling coaches to greatly improve the quality of feedback to players/athletes.
- Increase accuracy in time measurements of sport performance.
- Enabling referees, umpires and sport officials to make better decisions on rule infringements.
- Improvements in the design of sport equipment and apparel.
- Providing spectators with better viewing of sport performance (Gurubasavaraja.G 2020).

Soccer has increasingly evolved into a very athletic sport and soccer players are progressively becoming better athletes. Within a game, players repeatedly perform high-intensity actions in which muscle power is crucial. These bursts of explosive actions, such as accelerating, sprinting, kicking, tackling, turning, changing direction, and jumping may be completed over 500 times during the game. In particular, the decisive phases during the game require the player to perform at high intensity (Bangsbo et al. 2006; Rampinini et al. 2009). Speed, explosiveness, and the ability to intermittently repeat these high-intensity actions are fundamental to success in soccer (Cometti et al. 2001; Rampinini et al. 2009). Sprinting performance determines the outcome in match-winning actions (Cometti et al. 2001). A greater acceleration and sprinting ability increase the possibility to get to the ball first, to dribble past an opponent, to create or stop a goal-scoring opportunity.

Straight sprinting is the most frequent action in goal situations in soccer, for both the assisting and the scoring player (Faude et al. 2012; Haugen et al. 2014).

Soccer is a fast-paced game and speed and explosiveness have become increasingly crucial in game situations (Barnes et al. 2014; Haugen et al. 2014). In the last decade the number of sprints and sprint distance per game increased in the English Premier league by 85 percent and 35 percent respectively (Barnes et al. 2014). Top-class players perform more high-intensity sprint actions during a game and cover a greater distance at very high speeds (Mohr et al. 2003). Professional soccer players have also become progressively faster over the last 15 years (Haugen et al. 2012, 2014). Sprinting speed, agility performance, and repeated-sprint ability can distinguish the elite from the sub-elite players (Cometti et al. 2001; Kaplan et al. 2009; Rampinini et al. 2009; Rebelo et al. 2013) (Bram Swinnen 2016).

Tests and standards are one of the important bases for the planning, the follow up and the evaluation of the training programs in the field of football. As a result, before we go in details and analysis, the following question should be asked:

What is the qualitative estimation of the coefficients of variation by the use of Myotest in evaluating explosive force of footballers' lower extremities (less than 17 years old) in comparison to the application of Sargent test in terms of uncertainty ratios?

Hypothesis
The use of Myotest is more effective to evaluate the explosive force of footballers' lower extremities (less than 17 years old) in comparison to the application of Sargent test in terms of distrust ratios.

MATERIALS AND METHODS

The research problem imposed on us the descriptive method due to its suitability to the nature of the study to realize the aim of the research and to be sure from the hypothesis following the scientific steps.

Sergeant Jump Test
The objective of this test is to monitor the development of the athlete's elastic leg strength**.** To undertake this test you will require:

- Wall.
- 1 metre tape measure.
- Chalk.
- Assistant.

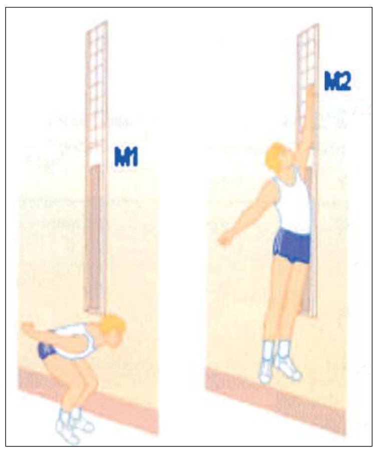

Figure 1. Sergeant Jump Test.

How to conduct the test:
The athlete:

- Chalks the end of his fingertips.
- Stands side onto the wall, keeping both feet remaining on the ground, reaches up as high as possible with one hand and marks the wall with the tips of the fingers (M1).
- From a static position jumps as high as possible and marks the wall with the chalk on his fingertips (M2).

The coach:
Measures the distance from M1 to M2.

The test can be performed as many times as the athlete wishes.

Analysis
Analysis of the result is by comparing it with the results of previous tests. It is expected that, with appropriate training between each test, the analysis would indicate an improvement.

Normative data for the Sergeant jump test:

Table 1. National norms for 16 to 19 year olds (Brian Mackenzie 2005).

Gender	Excellent	Above average	Average	Below average	Poor
Male	>65cm	50-65cm	40-49cm	30-39cm	<30cm
Female	>58cm	47-58cm	36-46cm	26-35cm	<26cm

Myotest

The Myotest (Myotest, Sion, Switzerland) system allows you to calculate the jump height using an accelerometer placed on the pelvis with integration calculations, allowing you to determine the sensor's vertical displacement (i.e. jump height).

Figure 2. Saut Puissance Test (A) and Saut Detente Test (B).

Research sample

The sample of the study consisted of 33 footballers from two different teams MCM and WRM (2017/2018):

- WRM: 18 players (less than 17 years old).
- MCM: 15 players (less than 17 years old).

Statistical analysis

In this study, we have used the program of statistical packages of social sciences (SPSS) for the statistical treatment in addition to these statistical tools.

Coefficient of variation –mean – standard variation- standard deviation- t-test.

RESULTS

Table 1. Descriptive analysis results of Saut Puissance Test (WRM).

Statistical variables	Mean	Standard deviation	Skewness	Kurtosis
Height	31.61	6.87	2.76	9.91
Capacity	46.41	7.31	0.520	0.477
Maximum capacity	50.28	6.68	0.587	0.335
Force	25.54	3.88	0.010	0.981
Velocity	239.44	16.88	-0.368	1.126

From the presented table, we can conclude that the values of descriptive statistical variable give the researcher a clear indication about all the values related to central tendency and dispersion scales. We can also conclude that the descriptive statistics are very important in the statistical test. The values of skewness were within their specified range (±3), as a result, we can say that the data falls within the normal distribution curve. On the other hand, the arithmetic mean of each of the statistical variables (height, capacity, force, velocity,) has reached (31.61)(46.41)(50.28)(25.54)(239.44). All these data with the values of standard deviation form together the main unit to do the following tests to know all the relations and differences for the variables.

Table 2. Descriptive analysis results of Saut Puissance Test (MCM).

Statistical variables	Mean	Standard deviation	Skewness	Kurtosis
Height	29.94	5.32	1.042	1.915
Capacity	43.91	7.35	0.322	-0.951
Maximum capacity	48.33	9.64	1.013	1.193
Force	22.74	2.91	0.482	1.075
Velocity	242.53	23.002	0.536	-0.088

From the presented table, we can conclude that all the values of descriptive statistical variable give the researcher a clear indication about all the values related to central tendency and dispersion scales. We can also conclude that the descriptive statistics are very important in the statistical test. The values of skewness were within their specified range (±3), as a result, we can say that the data falls within the normal distribution curve. On the other hand, the arithmetic mean of each of the statistical variables (height, capacity, force, velocity,) has reached (29.94) (43.91) (33.48) (74.22) (53.242). All these data with the values of standard deviation form together the main unit to do the following tests to know all the relations and differences for the variables.

Table 3. Descriptive analysis results of Saut Detente Test (WRM).

Statistical variables	Mean	Standard deviation	Skewness	Kurtosis
Height	33.35	2.78	-0.459	-0.963
Capacity	49.76	17.72	0.346	2.318
Force	45.63	30.81	0.777	-1.514
Velocity	357.27	171.09	2.297	5.610

From the presented table, we can conclude that the values of descriptive statistical variable give the researcher a clear indication about all the values related to central tendency and dispersion scales. We can also conclude that the descriptive statistics are very important in the statistical test. The values of skewness were within their specified range (±3), as a result, we can say that the data falls within the normal distribution curve. On the other hand, the arithmetic mean of each of the statistical variables (height, capacity, force, velocity,) has reached (35.35) (76.49) (63.45) (27.357). All these data with the values of standard deviation form together the main unit to do the following tests to know all the relations and differences for the variables.

Table 4. Descriptive analysis results of Saut Detente Test (MCM).

Statistical variables	Mean	Standard deviation	Skewness	Kurtosis
Height	31.71	5.07	0.974	0.085
Capacity	39.76	7.13	-0.322	0.568
Force	21.83	2.16	0.599	0.046
Velocity	232.40	34.62	-0.107	1.392

From the presented table, we can conclude that the values of descriptive statistical variable give the researcher a clear indication about all the values related to central tendency and dispersion scales. We can also conclude that the descriptive statistics are very important in the statistical test. The values of skewness were within their specified range (±3), as a result, we can say that the data falls within the normal distribution curve. On the other hand, the arithmetic mean of each of the statistical variables (height, capacity, force, velocity,) has reached (31.71)(39.76)(83.21)(232.40). All these data with the values of standard deviation form together the main unit to do the following tests to know all the relations and differences for the variables.

Table 5. Results of the differences between WRM and MCM Saut Puissance Test (less than 17 years) height scale.

Statistical variables	**WRM**		**MCM**		**T-value**	**Sig.**
	Mean	Standard Deviation	Mean	Standard Deviation		
Height	31.61	6.87	29.94	5.32	0.768	.448
Significant level		Df = 31			Uncertainty ratios (95%)	
Statistical decision: There are no statistically significant differences.						

From the presented table, we notice that there are no statistically significant differences. The T-value was (0.768) and it is non-function value considering (sig) .448 greater than the level of significance .05. The results of arithmetic mean of each team did not reach the statistical or the demonstrative significance at the level of uncertainty ratios (95%). Accordingly, we confirm that there are no statistically significant differences between the two groups. Hence, we accept the null hypothesis and we reject the alternative one.

Table 6. Results of the differences between WRM and MCM Saut Puissance Test (less than 17 years) capacity scale.

Statistical variables	**WRM**		**MCM**		**T-value**	**Sig.**
	Mean	Standard Deviation	Mean	Standard Deviation		
Height	46.41	7.31	43.91	7.35	0.977	.336
Significant level		Df = 31			Uncertainty ratios (95%)	
Statistical decision: There are no statistically significant differences.						

From the presented table, we notice that there are no statistically significant differences. The T-value was (0.977) and it is non-function value considering (sig) .336 greater than the level of significance .05. The results of arithmetic mean of each team did not reach the statistical or the demonstrative significance at the level of uncertainty ratios (95%). Accordingly, we confirm that there are no statistically significant differences between the two groups. Hence, we accept the null hypothesis and we reject the alternative one.

Table 7. Results of the differences between WRM and MCM Saut Puissance Test (less than 17 years) maximum capacity scale.

Statistical variables	**WRM**		**MCM**		**T-value**	**Sig.**
	Mean	Standard deviation	Mean	Standard deviation		
Height	50.28	6.68	48.33	9.64	0.684	.499
Significant level		Df = 31			Uncertainty ratios (95%)	
Statistical decision: There are no statistically significant differences.						

From the presented table, we notice that there are no statistically significant differences. The T-value was (0.684) and it is non-function value considering (sig) .499 greater than the level of significance .05. The results of arithmetic mean of each team did not reach the statistical or the demonstrative significance at the level of uncertainty ratios (95%). Accordingly, we confirm that there are no statistically significant differences between the two groups. Hence, we accept the null hypothesis and we reject the alternative one.

Table 8. Results of the differences between WRM and MCM Saut Puissance Test (less than 17 years) force scale.

Statistical variables	**WRM**		**MCM**		**T-value**	**Sig.**
	Mean	Standard deviation	Mean	Standard deviation		
Height	25.54	3.88	22.74	2.91	2.304	.028
Significant level	Df = 31				Uncertainty ratios (95%)	
Statistical decision: There are statistically significant differences.						

From the presented table, we notice that there are no statistically significant differences. The T-value was (0.444) and it is non-function value considering (sig) .660 greater than the level of significance .05. The results of arithmetic mean of each team did not reach the statistical or the demonstrative significance at the level of uncertainty ratios (95%). Accordingly, we confirm that there are no statistically significant differences between the two groups. Hence, we accept the alternative hypothesis and we reject the null one.

Table 9. Results of the differences between WRM and MCM Saut Puissance Test (less than 17 years) velocity scale.

Statistical variables	**WRM**		**MCM**		**T-value**	**Sig.**
	Mean	Standard deviation	Mean	Standard deviation		
Height	239.44	16.88	242.53	23.002	-0.444	.660
Significant level	Df = 31				Uncertainty ratios (95%)	
Statistical decision: There are no statistically significant differences.						

From the presented table, we notice that there are no statistically significant differences. The T-value was (2.304) and it is non-function value considering (sig) .028 greater than the level of significance .05. The results of arithmetic mean of each team did not reach the statistical or the demonstrative significance at the level of uncertainty ratios (95%). Accordingly, we confirm that there are no statistically significant differences between the two groups. Hence, we accept the null hypothesis and we reject the alternative one.

Table 10. Coefficients of variation in physical tests for MCM

Statistical variables	**Arithmetic mean**	**Standard**	**Standard Deviation**	**Coefficient of variation value**
Explosive force test of lower extremities (Saut Puissance)	31.611	1.620	6.874	16.74
Explosive force test of lower extremities (Saut Detente)	35.350	0.655	2.782	7.86
Sargent Test	42.666	1.806	7.665	17.96

It is noticed from the above table that the value of the coefficient of variation for the explosive force test of lower extremities using Myotest reached (16.74) (7.86), and the value of the coefficient of variation for the same test using Sargent test reached (17.96). As a result, we can say that the dispersion of Sargent test sample is greater when using the Myotest device. Indeed, the values of the coefficients of variation for both variables indicate that the accuracy ratios are the best when using Myotest. The obtained values indicate also the validity and the accuracy of these tests using the Myotest device in terms of dispersion values being low due to the high level of arithmetic accuracy. Therefore, the researcher believes that the validity and the effectiveness of using the Myotest device is better to reduce the simulation of uncertainty ratios, as well as to determine the levels and standards scores for each test in a scientifically correct manner. In addition to its demonstrative power.

Table 11. Coefficients of variation in physical tests for MCM.

Statistical variables	Arithmetic mean	Standard	Standard Deviation	Coefficient of variation value
Explosive force test of lower extremities (Saut Puissance)	29.940	1.375	5.328	17.79
Explosive force test of lower extremities (Saut Detente)	31.713	1.311	5.079	16.01
Sargent Test	43.366	2.101	8.140	18.77

It is noticed from the above table that the value of the coefficient of variation for the explosive force test of lower extremities using Myotest reached (17.79) (16.01), and the value of the coefficient of variation for the same test using Sargent test reached (18.77). As a result, we can say that the dispersion of Sargent test sample is greater when using the Myotest device. Indeed, the values of the coefficients of variation for both variables indicate that the accuracy ratios are the best when using Myotest. The obtained values indicate also the validity and the accuracy of these tests using the Myotest device in terms of dispersion values being low due to the high level of arithmetic accuracy. Therefore, the researcher believes that the validity and the effectiveness of using the Myotest device is better to reduce the simulation of uncertainty ratios, as well as to determine the levels and standards scores for each test in a scientifically correct manner. In addition to its demonstrative power.

DISCUSSION

The use of Myotest device is more effective to assess the explosive force of the lower extremities of football players in terms of their coefficient of variation in comparison to the application of Sargent test. This hypothesis stems from the principle that using the Myotest device in modern technologies is better than the traditional testing method (Sargent). Myotest device provides the greatest amounts of accuracy and velocity to evaluate the elements of physical fitness. Through this study, the obtained results reveal the ability of Myotest device to evaluate the explosive force characteristics of the lower extremities in a short period with less effort and more accuracy. All that is proved by the obtained data using Myotest device to measure and evaluate lower extremities' explosive force. The Myotest device also contributes in recalling the stored information in a short period of time, which contributes to solve many problems in the training process.

Throughout the results of the tables (10.11) the value of the coefficient of variation for lower extremities' explosive force (saut puissance) and (saut détente) using the Myotest is less than the values of the same test using Sargent test. As a result, we notice that dispersion in Sargent test is greater when using Myotest. The values of the coefficient of variation for both variables also indicate that the percentages of accuracy of tests is the best when using Myotest. Moreover, these values indicate the validity of tests using Myotest in terms of its low dispersion values because of the high level of accuracy in comparison to confidence intervals that are so low. Therefore, the researchers believe that the validity and the effectiveness of using Myotest is better to reduce the percentages of confidence intervals. As well as to determine the levels of each test in a correct scientific way.

According to the study of Theodoros M. Bampouras et al (2013) Myotest accelerometric system is a valid and reliable tool for the assessment of vertical jump height Therefore, this device can be used with confidence to detect within-group changes in longitudinal assessments (e.g., to verify the effectiveness of a specific training program, to quantify possible alterations during the competitive season) and between-group differences in cross-sectional comparisons (e.g., for talent detection) Compared to the other devices for field-based jumping evaluation (photoelectric cells and contact mats),Myotest has the advantages of being extremely portable and easy to use, relatively inexpensive, and also to respect the specificity between sport activities and jumping evaluation (e.g., it can be used on sand) (Theodoros M., et al. 2013).

According to the study of Brett A. Comstock et al (2011), The Myotest instrument demonstrates a very high degree of concurrent validity along with reliability as a field-testing instrument. The relative changes to track any type of training program will be sensitive to a, 5% of treatment effect. Placement of the Myotest instrument seems to be a vital consideration when using a barbell or when rotational effects or horizontal deviation are in play (Brett et al 2011).

According to the study of N. Houel et al (2011) the Myotest Pro system can be used to evaluate Vmax of subject's centre of mass during a squat jump with acceptable accuracy (error >0.3 m.s-1) and reliability (bias <0.1 m.s-1). The Myotest Pro estimate Vtoff with a small validity (95% limit of agreement >0.8 m.s-1) and underestimate t with a significant different bias (>0.03 s). So it cannot be used to estimate Vtoff and t of subject's centre of mass. Difference between results on Vtoff and t on both devices can be explained by the hypothesis of measurements of the Myotest Pro. If the centre of mass is currently used to evaluate the squat jump, Performance the Myotest Pro sensor can only estimate the acceleration of the point where it is fixed. In contrary to some study where soft development takes into account the position of the accelerometer to estimate the centre of mass kinetics' variables (Vmax, Vtoff, t) ,the Myotest Pro system only estimates the hip motion. In conclusion, the Myotest Pro can be used only to estimate Vmax of the centre of mass during a squat jump, or Vtoff and t of the hip where it is fixed. Force plate or other sensors could be preferred to estimate kinetics variables of the centre of mass (N. Houel 2011).

AUTHOR CONTRIBUTIONS

This study was conducted by a group of researchers from the Laboratory of Science and Techniques of Physical and Sports Activities, Algiers 3 University, Algeria; composed of:

- Khodja Bacem: Linguistic correction. The use of statistical package program of social sciences SPSS. Specifying the title and the research problem of the study. The contribution to the design of physical tests. Substantial contribution to acquisition, analysis and interpretation of data. Drafting the article, and final approval of the version to be published. Preparation and presentation of the published work by members of the original research group, including review, discussion, or revision including pre- or post-publication stages. Analysis and collection of data using statistical techniques. Preparation and presentation of published work, focusing on data presentation. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work.
- Tahar Briki: Specifying the title and the research problem of the study. The contribution to the design of physical tests. Substantial contribution to acquisition, analysis and interpretation of data. Drafting the article, and final approval of the version to be published. Preparation and presentation of the published work by members of the original research group, including review, discussion, or revision including pre- or post-publication stages. Analysis and collection of data using statistical techniques. Preparation and presentation of published work, focusing on data presentation. Agreement to be

accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work.

- Ahmed Hamza Ghadbane: Specifying the title and the research problem of the study. The contribution to the design of physical tests. Substantial contribution to acquisition, analysis and interpretation of data. Drafting the article, and final approval of the version to be published. Preparation and presentation of the published work by members of the original research group, including review, discussion, or revision including pre- or post-publication stages. Analysis and collection of data using statistical techniques. Preparation and presentation of published work, focusing on data presentation. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work.

SUPPORTING AGENCIES

No funding agencies were reported by the authors.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

REFERENCES

Bampouras, T. M., Relph, N. S., Orme, D., & Esformes, J. I. (2013). Validity and reliability of the Myotest Pro wireless accelerometer in squat jumps. Isokinetics and Exercise Science, 21(2), 101–105. https://doi.org/10.3233/IES-130484

Comstock, B. A., Solomon-Hill, G., Flanagan, S. D., Earp, J. E., Luk, H.-Y., Dobbins, K. A., Dunn-Lewis, C., Fragala, M. S., Ho, J.-Y., Hatfield, D. L., Vingren, J. L., Denegar, C. R., Volek, J. S., Kupchak, B. R., Maresh, C. M., & Kraemer, W. J. (2011). Validity of the Myotest® in Measuring Force and Power Production in the Squat and Bench Press. The Journal of Strength & Conditioning Research, 25(8). https://doi.org/10.1519/JSC.0b013e318200b78c

Cortsen, K., & Rascher, D. A. (2018). The Application of Sports Technology and Sports Data for Commercial Purposes. InTech. https://doi.org/10.5772/intechopen.80742

Houel, N., Dinu, D., Faury, A., & Seyfried, D. (2011). Accuracy and reliability of the Myotest Pro system to evaluate a squat jump. Procedia Engineering, 13, 434–438. https://doi.org/https://doi.org/10.1016/j.proeng.2011.05.110

Mackenzie, B. (2005). 101 Performance Evaluation Tests, Electric Word plc, London.

Sanjib Kumar Dey. (2020), " Modern technology and sports performance: An overview", International Journal of Physiology, Nutrition and Physical Education, Volume 5, Number 1, p 212-216.

Schmidt, S. C. E., Gnam, J.-P., Kopf, M., Rathgeber, T., & Woll, A. (2020). The Influence of Cortisol, Flow, and Anxiety on Performance in E-Sports: A Field Study. BioMed Research International, 2020(1), 9651245. https://doi.org/https://doi.org/10.1155/2020/9651245

Subic, A. et al. (2011). The Impact of Technology on Sport IV. 5th Asia-Pacific Congress on Sports Technology, p2.

Swinnen, B. (2016). Strength Training for Soccer (1st ed.). Routledge. https://doi.org/10.4324/9781315665276

Viduka, D., Ilić, L., Dimitrijević, V. (2021). Modern Technologies in Sport, with Reference to Video Technologies. Paper presented at Sinteza 2021 - International Scientific Conference on Information Technology and Data Related Research. https://doi.org/10.15308/Sinteza-2021-277-281

