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Effect of Training in zone 5 (Redline zone) on Developing Repeated-Sprint Ability (RSA) in U19 football players.

Said MAROUF.
SPAPSA Laboratory, Hassiba Benbouali University, Algeria,
s.marouf@univ-chlef.dz

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Corresponding author
Said MAROUF.
E-mail: s.marouf@univ-chlef.dz

Abstract

This study aimed at examining the effect of using the zone5 Red-Line training zone on developing the repeated sprint ability (RSA) in RC Relizane; U19 football players. To conduct the study, an experimental approach was adopted according to the nature of the study. A sample included 20 players divided into two sub-samples of equal size was used. 9-week basic training units were accomplished. RSA post-tests were then conducted on the two chosen sub-samples. Overall results were deemed significant, meaning that there were statistically significant differences between the means of the two groups in favor of the experimental group.

I. Introduction

Many different football associations and governing bodies across the globe have been interested in supporting their technical staff with a physical preparation committee, consisting of experts and physical attendants. They also interested in enhancing the use of various types of advanced technologies for the purpose of increasing physical activity level (PAL) of athletes, with the aim of conveniently employing the basic skills and techniques in sport contests and daily training programs. In this regard, a key issue that fitness trainers and instructors should clearly take care to build on sound and fair scientific foundations would be the development of aerobic and anaerobic metabolism to enhance recovery and adaptation (RA) at the physiological level after the training exercises. According to the athletic training literature, scholars have sought to design the so-called five heart rate-based training models. The five different heart rate training ranges, or HR-training zones, categorize hierarchically every intensity scale of training from one to five (1-5) with regard to the athlete's target workout heart rate. Sport science has proven that each sport-specific HR zone corresponds to a different intensity level and represents scientifically a particular physiological system and specific attributes that depend on the volume and intensity of the training and the mechanisms responsible for changes in performance within the training zone (Saad, 2013). The athletic training in the five zones is apparently just an endurance training but it is a working for optimizing all energy systems. Energy in the human body is the source of muscle contraction and it is the source of the different types of athletic performance. Bengoua (2011) asserts that the modern approach to reach the highest level is to focus on training programs built on sound scientific foundations to accomplish all of the overall training goals, because the rehabilitation and retraining intervention and the scientific education programs as well as the newer studies in football are a guarantee for raising the level of performance in our players (Bengoua et al, 2011). Football represents repeated explosive efforts over a number of times. These efforts imply an explosive effort with the ability to be repeated, meaning that focusing on a special type of training which characterizes the game (Koutchouk, 2011), for which specialists must focus on when preparing sport-specific training programs. In a study carried out by Boufaden **(**Boufadene, 2016) related to the correlation between measured maximal oxygen uptake

(VO 2max) and anaerobic threshold (AT) and speed-strength endurance in U19 soccer players using a descriptive correlational method, speed endurance was measured by the so-called Bangsbo Sprint Test (BST). After comparing the two indicators, the scholar concluded that there is a correlation between maximal oxygen uptake (VO 2max) and anaerobic threshold (AT) and speed-strength endurance in favor of the anaerobic differential threshold. The scholar also recommended the use of the anaerobic differential threshold in determining the degree of endurance training for increasing speed endurance or repeat sprint ability (RSA) in soccer players. Even though the efficiency of HR-based training system for improving soccer performance has been proved in previous studies, and most improvements have been achieved by examining the effects of HR-Zones training models on performance during soccer training activities and soccer specific tests. Nonetheless, it is possible to further improve the efficiency of HR-training zones by focusing on the determinant factors of RSA in proportion to the nature of football game.With this goal, this work explores the effect of using the Z5 Red-Line training zone on developing the repeated sprint ability (RSA) in U19 football players to be a mainstay for researchers, instructors and trainers in sports training. To solve this problem, it was necessary to raise the question: does training in Z5 Redline zone affect positively the development of Repeated-Sprint Ability (RSA) in U19 football players?

II. Method and Materials

This section describes in detail the following:

2.1. Research Population

The study population consisted of 300 U-19 soccer players competing in the Second National Division; Ligue Nationale du Football Amateur - LNFA, for the sports season 2017/2018.

2.2. Research Sample

The sample consisted of 20 RC Relizane soccer players selected and divided purposely into two equal sub-samples, from which anthropometric dimensions had been measured, and the sample's equivalence and homogeneity had been confirmed.

2.3. Research / Study Procedures:

2.3.1. Method: In this pilot study, an experimental approach based on the type of data available was adopted.

2.3.2. Tests:

All subjects were tested as a part of their training using two repeated sprint test protocols; namely, the 12 × 20m/40sec repeated sprint test (Cazorla, 2006), and the 7 × 34.2 m repeated sprint test (Bangsbo, 1994).

2.3.2.1. 12 x 20 m/40sec repeated sprint test (Cazorla sprint test)

The test procedure illustrated in the following figure:

The sum of total time was calculated and the best time was recorded.

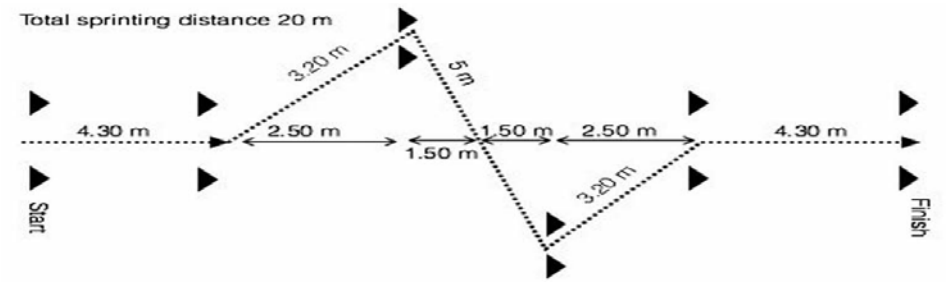

Figure1:The 12 x 20 m repeated sprint(RSA) test (Cazorla sprint test).

2.3.2.2. 7 x 34.2 m repeated sprint test (Bangsbo sprint test)

The test procedure demonstrated in figure 2, below:

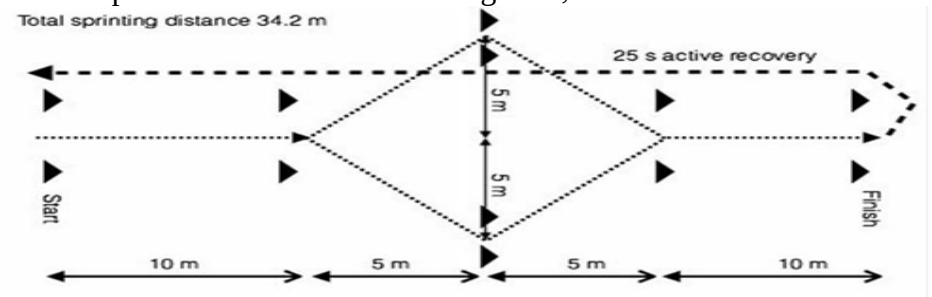

Figure 2: The7x34.2 m repeated sprint(RSA) test (Bangsbo sprint test).

2.4. Scientific Basis for Testing

2.4.1. Stability testing

The initial test and repeat test were applied on a sample of 04 soccer players. The initial test results are repeatable from the same Sample. Pearson correlation coefficient (Pearson's r) value was extracted. The calculated t-value was greater than the tabulated t-value ($r = 0.87$, $p <$

0.001), which confirms that the tests are considered to have a high level of stability.

2.4.2. Validity

To ensure the test validity, the square root of the reliability coefficient was calculated. All tests were found to have a high degree of validity, as the calculated t-values (0.98-0.94) were greater than the tabulated t-values for Pearson's r ($r = 0.87$, $p < 0.001$).

2.4.3. Objectivity:

Accurate and fairly easy to use tests were applied to participants, where a research objective was clarified and spatial and climatic conditions that may affect the test results were standardized as well as adequate and suitable tools were adopted.

2.5. Statistical tools:

For the quantitative analysis, SPSS software (Statistical Package for the Social Sciences) was used to process data, and produce descriptive and inferential statistics.

III. Results

In this section, following the presentation, analysis and discussion of our results, we will endeavor to examine the results with respect to the questions posed at the onset of the research paper.

Presentation and analysis of the pretest/posttest scores of the two sub-samples:

Means from the 12 × 20 m repeated sprint test (Cazorla sprint test)

Table 1: shows pretest/posttest scores from 12 × 20 m repeated sprint test for both sub-samples

Statistical Scales / Samples	N-Sample Size	Pre-test		Post-test		Calculated T-value	Tabulated T-value	Significance Level
		$\bar{x}1$	$\sigma 1$	$\bar{x}2$	$\sigma 2$			
Check sample	10	4,75	0,27	4,82	0,19	1,96	2.26	Significant
Experiment sample	10	4,73	0,24	5,08	0,13	3,42		Significant

As follows from Table 1 above, it is clear that there were statistical significant differences between players in the 12 × 20 m repeated sprint test. The results indicated that the calculated value for t, 1.96 is less than the tabular value, 2.26, for 9 degrees of freedom at the 5% level of significance. It may therefore be stated that the control group

is not statistically significant at the 0.05 level. For a significance level of 0.05 and 9 degrees of freedom, the calculated value for the t-test, 3.42 is greater than the tabular value, 2.26, which may correctly conclude that there is a significant difference between pretest and posttest average scores of the experimental group. However, examining the results for pretest/posttest experimental group confirmed that the experimental group is statistically significant at the level of 0.05, and accordingly, training in the Z5 Red-Line zone has a positive effect on developing the repeated sprint ability (RSA) in soccer players.

Means from the 7 x 34.2 m repeated sprint test (Bangsbo sprint test)

Table 2: illustrates pretest/posttest scores from 7 x 34.2 m repeated sprint test for both sub-samples

Statistical Scales / Samples	N-Sample Size	Pre-test		Post-test		Calculated T-value	Tabulated T-value	Significance Level
		$\bar{x}1$	$\sigma 1$	$\bar{x}2$	$\sigma 2$			
Check sample	10	6,40	0,40	6,43	0,60	2,10	2.26	Significant
Experiment sample	10	6,40	0,54	6,44	0,42	2,31		Significant

It is evident from Table 2 that the pretest-posttest results from 7 x 34.2 m repeated sprint test (Bangsbo sprint test) showed statistical significant differences between both studied groups. The results indicated that the calculated value for t, 2.10 is less than the tabular value, 2.26, for 9 degrees of freedom at significance level $\alpha = 0.05$. It may therefore be noted that the control group is not statistically significant at the 0.05 level. The results further indicated, for a significance level of 0.05 and 9 degrees of freedom, that the calculated value for the t-test, 2.31 is greater than the tabular value, 2.26, which may obviously conclude that there is a significant difference between pretest and posttest average scores of the experimental group. It may therefore be worth noting that the overall results uncovered that the experimental group is statistically significant and thus, using the Z5 Red-Line zone in workouts has a positive effect on developing the repeated sprint ability (RSA) in soccer players.

Presentation and analysis of the posttest average scores of the two groups

Table3: uncovers t-statistic and t-values of posttest scores of experimental and control groups

Statistical Scales / Tests	Control Group		Experimental Group		Calculated T-value	Tabular T-value	Significance Level
Cazorla Sprint Test	4,82	0,19	5,08	0,13	3,37	2.10	
Bangsbo Sprint Test	6,43	0,60	6,44	0,42	6,40		Significant

Examining the results from the 12 × 20 m repeated sprint test (Cazorla sprint test) and the 7 x 34.2 m repeated sprint test (Bangsbo sprint test) revealed that there were statistical significant differences the mean of the posttest scores between both; the experimental group and the control group. The results however indicated that the calculated values for t, 3.37 and 6.40 for 12 × 20 m repeated sprint test and 7 x 34.2 m repeated sprint test; respectively, are less than the tabular value, 2.26, for 9 degrees of freedom at significance level $\alpha = 0.05$. It may therefore be worth noting that the mean of the posttest scores between both; the experimental group and the control group, is statistically significant and thus, it may be possible to conclude that using the Z5 Red-Line zone in workouts has a positive effect on developing the repeated sprint ability (RSA) in soccer players of the experimental group.

IV. Discussion

The main findings from the present research indicate that sports training in the Z5 Red-Line zone has a positive effect on developing the repeated sprint ability (RSA) in U-19 soccer players who perform differently across repeated sprint tests. In keeping with our research objectives, we set forth a hypothesis states that there are statistically significant differences in RSA performance tests between the experimental group (E) and the control group (C) and in favor of the experimental group. Then, the hypothesis was tested and compared with the results from the tests (Table 3). Examining the results from the 12 × 20 m repeated sprint test and the 7 x 34.2 m repeated sprint test further indicated statistical differences in favour of the experimental group. This could be explain by the fact that the obtained t-values in both 12 × 20 m and 7 × 34.2 m repeated sprint tests, where

the calculated value for t is less than the tabular value, for 9 degrees of freedom and at the 5% level of significance. Nevertheless, the positive development effect and the remarkable differences observed between E and C groups' performances across both repeated sprint tests could be attributed to the differences in the tests design, which emphasise the importance of using the Z5 Red-Line zone in the athletic training programs. The study results confirmed the important role of aerobic and anaerobic capacities of soccer players to be able to sustain the repeated sprint performance during football matches and trainings. Researches have supported an association between that repeated sprint ability (RSA) and maximal oxygen uptake (VO2 max). This is, in a point of fact, consistent with (Boudfane et al, 2017) study. The authors report that there is positive correlation between the maximal oxygen uptake (VO2 max) and the repeated sprint ability (RSA) performance indicators. A prior research has confirmed that the development of repeated sprint ability (RSA) is attributed to the adjustment of physical and psychological functional systems to the training load and not only to running ability (Al-Rawi, 2004). Rather, it is reasonable to believe that a consideration should also be given to recovery, load rotation and distribution (impact force). The research shows that the functional adaptation in the anaerobic phosphate and anaerobic lactic transition point were achieved within 10-week exercise program (El Rawi, 2004)**.** Hajjar Khirfan **(**Hajjar Khirfan, 2011) also asserts that tiny space workouts allow the player to perform different types of gameplay situations (repeat thrice without ball, then thrice with ball) with the existence of a tremendous number of players in tiny spaces, which create a physical burden and allow performing effective repetitions, and thus achieving speed, accuracy and consistency in performance. Further, the study results are, in a point of fact, consistent with (Senussi, 2014) study related to the effect of using integrated exercises (physical-skill) with a ball to develop the physiological capacity. The author proposed a training program using integrated exercises and found that the latter has a positive effect on developing some physical and physiological skills. In the same context, another research demonstrates that the acquisition of high physical skills is attributed to the integrated training approach that provides a great way to stay motivated during exercises (Masailati, 2012). This explanation does not contradict the results of other studies where has been uncovered that the use of plyometrics as a training

based on an interval repetition technique improves explosive power and anaerobic capacity, that is, focusing on increasing the system's efficiency leads to improving functional efficiency and therefore attaining athletic success (Hallouz, 2019). This indeed supports the outcomes related to a study carried out by (Saraiya, 2018) who asserts that training programs for anaerobic endurance work to develop anaerobic phosphate and lactic characteristics, but the period of hospitalization is dependent on individual differences. As for Cazorla's study **(**Cazorla, 2006), the author pointed out that the repeated-sprint ability (RSA), whether with or without the ball, is now well accepted as an important fitness component in modern football. The study consisted of repeat sprint test of anaerobic capacity, involving twelve 20m sprints performed every 20 seconds. The results however are compared to the best result recorded at the given distance. Hence, the results from the aforementioned studies are consistent with the results of this current paper, which highlights accordingly that using the Z5 Red-Line zone in the training programs has a positive effect on developing the repeated sprint ability (RSA) in soccer players for attaining a higher level of performance during matches and daily trainings.

V. Conclusion

The regulatory framework for sport training that is clearly built on sound and fair scientific foundations is the language of modern sports training and the direct entrance to dramatically raising the level of sports performance without wasting time and effort in other trends, which are a far cry from attaining high-quality specialized athletic performance. Modern football is characterized by a tremendous increase in the training load. The nature of competitions implies timely and excellent high frequency performance without falling into detraining during the match-play periods. From the present research that has been undertaken on the effect of using the Z5 Red-Line training zone on developing the repeated sprint ability (RSA) in RC Relizane; U19 football players, it is worth note that there was a significant difference between pretest and posttest average scores of both the experimental and control groups in favor of the experimental group, and therefore, it may be possible to conclude that using the Z5 Red-Line zone in workouts has a positive effect on the improvement

of repeated sprint ability (RSA) in soccer players. Given the fact that it was mandatory for instructors an trainers to study and investigate the most appropriate methods and approaches for developing training processes, further research on training in the five HR-zones and their impact on the training process is desirable.

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