

## A Literature Review on Importance of Speedendurance Assessment for Soccer Players

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### Abstract

**Background and Aim:** Speedendurance is a key component to success in many sports which is especially vital to sports that have a large playing surface and is of great importance in soccer players at different competitive levels. For the estimation of sprint speedendurance applies a speedendurance test to obtain data on the efficiency of performance that is maximal for the soccer players. The aim of this literature review was to know the importance of speedendurance assessment for soccer players.

**Methods:** Literature searches from 2010-2019 were collected in this study. Totally 7 articles are finalized on the bases of selection criteria. The articles selected were randomized controlled trials and systematic reviews which are published in English language.

**Results:** The present review article shows the benefits and detail procedures of speedendurance assessment by means of 3 important tests for soccer players.

**Conclusion:** The study concludes that speedendurance assessment is a great pre-season test for individuals and teams to perform, the article suggested that this speedendurance test has effect in assessing speedendurance performance among soccer players.

**Keywords:** Speedendurance Tests; Soccer Players and Speedendurance Performance; 7x35m Speedendurance Test; Running Anaerobic Sprint Test; Yo-yo Intermittent Recovery Level 2 Test and Repeated Sprint Test

### Introduction

This is particularly important in sports with a broad playing surface, such as soccer, hockey, basketball, singles tennis, middle distance track and field events, and so on. Soccer includes a variety of sports, such as cycling, low- and high-speed running, and sprinting." The ability to repeatedly perform maximum or near maximal short-duration activities with brief recovery times" is more important in soccer players, and this ability distinguishes players at different competitive levels [1]. During the most intense

periods of play, soccer requires several high-intensity movements that trigger fatigue [2]. The anaerobic energy turnover and muscle recruitment are high during these game intervals, which can exhaust the physiological mechanisms that counter fatigue [3]. Thus, high intensity training regimes are of great importance for competitive soccer.

The speedendurance training enhance fatigue resistance and repetitive sprint ability to greater extent during vigorous intermittent exercise [4]. Speedendurance training is recommended

to improve performance of maximal exercise for a relatively short period of time and maintain exercise intensity during repeated high-intensity efforts [26]. Speedendurance production training and speed endurance maintenance training are the two categories of speedendurance training [5]. Speedendurance production training is conducted at very high intensities during approximately 30 s exercise intervals and 2-3 min rest periods to ensure sufficient recovery to undertaking the next exercise bout. This form of training is structured in soccer as a series of near-maximal effort runs with related technical challenges and anaerobic pathways [6]. And has been shown to induce marked increases in high-intensity performance in trained runners and soccer players are measured with the help of many speedendurance tests [7].

The Speedendurance test is a great pre-season test for individuals and teams to perform and is designed to assess how quickly a test taker is able to complete within a set time period. For the estimation of sprint speedendurance various speedendurance tests apply to obtain data on the efficiency of performance among soccer players.

Speedendurance testing is determined by repeat bouts with a slow jog back to the start line and rest recovery duration should approximate 10 -30 seconds [8]. The aim of this review literature is to understand the clear view about the various test used for speedendurance assessment and their procedures in soccer player.

**Methods**

**Criteria for considering studies for this review**

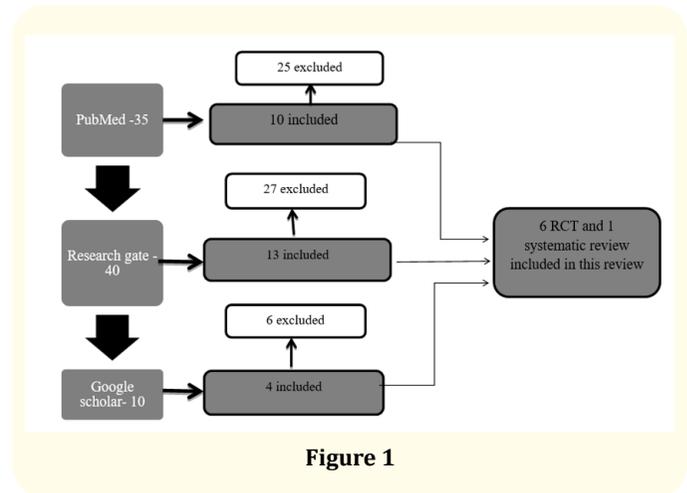
The following set of criteria: a) the design being an RCT, b) players playing soccer, c) All the assessment based on speed endurance d) the studies been published in peer reviewed journals between 2010 to 2019.

**Search strategy for identification of studies**

A search was performed using computerized databases Pub Med, Research gate and Google scholar in the period from 2010 to 2019. This was combined with the subject heading speed endurance assessments and other keywords speed endurance tests, soccer players, 7x35m speedendurance test, running anaerobic sprint test (RAST), yo-yo intermittent recovery level 2 test and repeated sprint test which is published in English language. Eighty five articles were found references of identifying articles,

relevant conference proceedings any additional study that seemed eligible was retrieved and assessed according to title, abstract and keywords. For the Second level search twenty seven articles were selected according to inclusion and exclusion criteria's. Finally the study progresses with seven full texted original data RCT articles.

**Article selection**



**Figure 1**

**Results**

The present review article shows the benefits and detail procedures of speed endurance assessment by means of 3 important speed endurance tests for soccer players. The search strategy initially identified 85 studies, 27 potentially relevant. From reviewing the titles and Abstracts, 18 of these 27 studies were excluded as their test procedure reported incomplete results. Two studies were excluded because its population included other than soccer. Overall, seven studies were identified as fulfilling all the inclusion criteria for this literature review. All seven research Studies were collected from 2010 to 2019 in medical research database (i.e. Pub Med, Research gate and Google scholar).

**Procedure**

**Speedendurance test I (7x35m speed endurance test)**

The “7x35m” test is literally 7x34, 2m. The test subjects run the distance from point A to point B at the maximum sprinting speed via the marked path, which after the first 10m had a change of direction in one way and after 5m a change of direction in another way. After finishing the sprint, the subject shall be stopped at the

S no	Name of the author	Study title	study methods	Study description	Study conclusion
1	Slobodan Andrasic., <i>et al.</i> Nenad Zivanovic., <i>et al.</i> Zoran Milosevic <i>et al.</i> Veroljub Stankovic., <i>et al.</i> Nebojsa Randjelovic., <i>et al.</i> Momir Ciric., <i>et al.</i> (2013)	Characteristics of speed endurance measured by modified 7x35 meters test and difference between the elite and amateur footballers	Sample of subjects in this test comprised a total of 197 footballers, out of which 76 elite ones and 121 amateur rank competition footballers	The above-mentioned 7x35 m test was used to estimate distance speedendurance, though it was slightly modified in that the 50 m distance was run seven times in both directions in a straight line. Professional footballers ran the entire distance in 64, 49 seconds (the results ranged from 59, 03 to 73 seconds), while amateurs ran it in 66, 87 seconds (the result ranged From 59, 85 to 77, 27 sec.).	The modified 7x35m test, also known as the 7X50 m test, is a measuring device that accurately assesses a footballer’s distance speed training. Based on the achieved times of testing by simple ordering of the reference values in footballers can be classified according. To the level of their training of the speedendurance. The Practical value of the test is relatively easy, practical application, simple procedure and the clearance of the obtained data that points for further research. Bad results will mean intensify work on training apparatus for the speedendurance and vice versa, good results will point to the thoroughly done previous period and readiness of the footballers to meet the demands of the contemporary Football.
2	Nenad Zivanovic., <i>et al.</i> Momir Ciric., <i>et al.</i> Slobodan Andrasic., <i>et al.</i> Vladan Cosic., <i>et al.</i> (2013)	Differences in sprint speed and load size between soccer and handball fadaration rank players determined by the 7x35m test	The sample of subjects in this study is eight handball and soccer players of the Premier league of Serbia. Testing was conducted. The average age of the handball Players is 22yrs and soccer Players are 21yrs.	The study was conducted on a sample of 8 soccer players and 8 handball players by using the 7x35m test as a measuring instrument for the assessment of sprint speed endurance. During the performance test, all subjects wore Polar Team System belts to measure the frequency of heart beats.	From comparative analysis of the results between two different groups of Athletes, handball and soccer players from the 7x 35m test, it can be concluded that the soccer players compared to the achieved time showed better results in both the test and in the structure of the load which showed faster recovery and their fatigue was less.

3	<p>Leandro Mateus Pagoto Spigolona., <i>et al.</i> Claudia Regina Cavaglieri., <i>et al.</i> Antonio Carlos Gomes., <i>et al.</i> Eduardo Henrique Frazilli Pascoal., <i>et al.</i> Juliano Henrique Borges., <i>et al.</i> João Paulo Borin., <i>et al.</i> (2016)</p>	<p>Training program influences the relation between functional and neuromuscular performance indicators during the season in young soccer players</p>	<p>The participants in this study consisted of 16 soccer players with an average of four years of systematic soccer practise.</p>	<p>The Running-based Anaerobic Sprint Test (RAST) In this test, athletes had to run the distance of 35 m, 6 times, in the maximum possible speed, with rest periods of 10 s between each runs. All endurance training, including general endurance (or aerobic), speedendurance (or anaerobic), and particular endurance (anaerobic/aerobic), are included because they are all connected to the power supply system, which ensures efficient efficiency, and because of the relationship to the sports characteristic stimuli..</p>	<p>RAST is a measure of anaerobic metabolism, i.e. speedendurance, and it was concluded that the functional efficiency measured by RAST is not solely dependent on neuromuscular performance.</p>
4	<p>Slobodan Andrasic., <i>et al.</i> Milan Cvetkovic., <i>et al.</i> Zoran Milic., <i>et al.</i> Darijan Ujsasi and Dejan Orlic., <i>et al.</i> (2016)</p>	<p>Assessment and differences in anaerobic capacity of football players playing on different positions in the team, using rast test</p>	<p>A total of 60 cadet football players (14-16 years old) were included in the total sample of respondents. Five groups of players were formed, namely: Centre-backs (12), the full backs (15), midfielders (14), offensive Players (13) and goalkeepers (6).</p>	<p>RAST test consists of six 35-meter sprints and 10-second rest between each section which serves to rotate. After the measured times for the six finished sections, strength for each run is calculated, and provides information about the Strength and maximal sprint speed endurance.</p>	<p>Speed-endurance, defined as the ability to endure repeated short-term intense efforts, is a type of body resistance. The ability of the body to adapt to and survive acidification and the emergence of a higher blood lactate concentration without a significant reduction in work capability is critical-for football players, this is the most important ability they should have provided the physiology of their efforts during the game.</p>

5	Magni Mohr, <i>et al.</i> Peter Krustrup, <i>et al.</i> (2016)	comparison between two types of anaerobic speed endurance training in competitive soccer players	Eighteen male university soccer players (Age $19 \pm 1$ yr., body height $1.79 \pm 0.06$ m, body mass $79.4 \pm 4.4$ kg) took part in the study.	All participants completed the Yo-Yo intermittent recovery level 2 tests and a repeated sprint test as previously described before and after 4-week training intervention. The Yo-Yo IR2 consisted of 2x20m Shuttle runs performed indoors on a wooden surface, and the RST was performed outdoors on an artificial grass surface.	The current research is the first to compare the results of anaerobic and aerobic speed endurance training. Yo-Yo IR2 performance was high for speed endurance maintenance training (26 percent) and even higher for speed endurance development training (27 percent) after four weeks of in-season training (50 percent ).
6	F. Marcello Iaia, <i>et al.</i> Matteo Fiorenza, <i>et al.</i> Enrico Perri, <i>et al.</i> Giampietro Alberti, <i>et al.</i> Gregorian P. Millet, <i>et al.</i> (2015)	The effect of two speed endurance training regimes on performance of soccer players	Originally, eighteen young male soccer players from a professional team with at least eight years of experience were recruited to take part in the study; however, only thirteen subjects completed it.	A repeated Sprint test (RSA) and the Yo-Yo Intermittent Recovery Test Level 2 were administered at the start of the baseline phase, as well as before and after the intervention period (Yo-Yo IR2).	At baseline Yo-Yo IR2 performance was respectively, in the SEP and SEM group and increased during the training period with greater improvement in the SEP than SEM group. Pre-intervention mean sprint time in the RST in the SEP and SEM group, respectively, and was improved by post intervention.
7	Thomas peturssongunnarsson, <i>et al.</i> Petermoller Christensen, <i>et al.</i> Kris holes, <i>et al.</i> Danny Christiansen, <i>et al.</i> , and Jens Bangsbo, <i>et al.</i> (2012)	Effect of additional speed endurance training on performance and muscle adaptations	The study included eighteen male soccer players from a team and the Second Division, ranging in age, height, and weight from 23.9 to 0.1 year, 1.84 to 0.02 m, and 77.2 to 1.9 kg, respectively.	The Yo-Yo IR2 test consisted of repeated 20-m shuttles at a progressively increasing speed controlled by audio bleeps from a CD player. 13 players completed the Yo-Yo IR2 tests before and after the SET intervention. Before the testing, the players were familiarized with the testing procedures on one to three separate occasions.	Performance on the Yo-Yo IR2 test was up11%, while performance on other tests (the SP and AG tests) remained unchanged.

Table 1

section of the following 10 m, turn and lightly run to start line. Stopping and starting to run slowly back to the starting point should be done in a period of 25 seconds (which considering the average sprint time of 6.41 sec is an active rest in a 1:4 relation, which theoretically should be sufficient for the restoration of the ATP and CP mechanisms). The test consists of 7 repeatable sprints on a marked path (A and B), and every achieved time is measured and noted. For the test to be executed on takes at least three executives: 1. Measures the time it takes to reach the finish line, 2. Measures the rest time of 25 sec, 3. enters the results in a previous report. To test an entire team the predictable amount of time per player is about 4 minutes.

The updated 7x35m test was used to test the glycogen function of energy compensation and to estimate the speedendurance training standard in footballers. To estimate the level of distance speedendurance the above mentioned 7x35 m test was applied in the modified form i.e. 50m distance and seven repeatable sprints in a straight line in both directions.

#### **Speedendurance test II (running anaerobic sprint test (rast))**

Athletes in this Running Anaerobic Sprint test had to run a distance of 35 metres six times at their optimum pace, with a 10-second rest interval in between each run. Two Fit photocells located at the beginning and at the end of the 35 m running anaerobic sprint test which is used to collect the time. After the measured times for the six finished sections, strength and fatigue index are calculated, which provides information about the strength and maximal sprint speed endurance. The maximum level is 300 watts, and the minimum average rate of power output is (Max Power-Min Power)/Total accumulated time. If the score is greater than 10, the competitor can rethink their training routine and concentrate more on speed endurance, whereas a score of less than 7 is outstanding

#### **Speedendurance test III (YO-YO intermittent recovery level 2 test and repeated sprint test)**

The Yo-Yo IR2 was conducted indoors on a wooden surface and consisted of two 20-meter shuttle runs, with the speed steadily increasing through the test speeds, which were indicated by audio beeps. The achieved distance was registered and determined when the subjects were unable to cross twice the finish line in time prior to the audio beep. Wireless infrared timing gates were used to

decide the outcome. A structured warm-up was performed prior to the test, and both participants had a clear understanding of the tasks. The tests were administered on different days or at least 48 hours apart to allow for adequate recovery.

### **Discussion**

The primary goal of this literature review was to determine and comprehend the different tests used for determining speed endurance in soccer players, as well as their procedures which had previously received little attention and helps to affirm that speed endurance assessments can play a crucial role in attaining positive outcomes for soccer players.

Based on a comparison of the results of the 7 x 35m test between two different groups of athletes, handball and soccer players, it can be inferred that the soccer players performed better both in the test and in the structure of the load, indicating that they were less fatigued and recovered faster [9]. 7x35m speedendurance test was used as a measuring instrument and the test results indicate that the soccer players had better results in speed endurance performance. The Practical value of the test is relatively easy practical application and simple procedure.

Results of RAST demonstrate that where a low percentage of time is devoted to stimuli for the production of speed endurance and, where certain training methods characteristics are ignored, ability level indicators are not retained and all potentialities of such particular capacity and others are altered [11]. Running anaerobic sprint test (RAST) is a reliable and simple field test that can be performed easily and similar to the parameters of repeated sprint activity during field-based team sports. In the case of Yo-Yo IR2 Over the course of four weeks of in-season training, the improvement in Yo-Yo IR2 performance was significant (26%) for speed endurance maintenance and even greater for speed endurance production (50%). These gains are comparable to those seen in well-trained professional soccer players over a full pre-season cycle. and higher than in previous short-term in-season studies [12]. Yo-yo intermittent recovery level 2 test. It should be emphasized that Yo-Yo IR2 performance that was 10-50% worse than in elite soccer players, but still 40% better than the high-level junior players. In Additional anaerobic speedendurance training induce 50% increase in Yo-Yo IR2 performance.

Despite the fact that each of these three speedendurance tests used different assessments with different features, the need for progression across the evaluation period was a common finding in all three studies. All of the studies included in this analysis showed that this type of evaluation would lead to positive results in terms of improved speed and endurance performance during the sport.

Due to a lack of articles that met the selection criteria, only soccer players were included in this study; thus, future studies could concentrate on sports fields that need larger playing surfaces. As compared to the above three assessments, the incremental running test to exhaustion and the 5m multiple shuttle run test are both speedendurance tests that provide less evidence. There are less research papers on speedendurance assessment, and more attention should be paid to it in order to produce future research publications that will benefit players who want to improve their speedendurance results.

## Conclusion

The study concludes that speedendurance assessment is a great preseason test for individuals and teams to perform; it can be useful in assessing the basic fitness of the team as a whole and providing valuable information for training. Speed endurance training is recommended to increase efficiency of maximal exercise during repetitive high-intensity efforts on the levels that require several high-intensity activities provoking exhaustion during the most intense periods of play for the enhancement of repeated fatigue. Overall, all three speedendurance tests (Running anaerobic sprint test (RAST), Yo-yo IR2 efficiency, and 7x35m speedendurance test) have demonstrated significant changes in assessing soccer player performance using evidence collected between 2010 and 2019. Finally, the study concludes that these three speedendurance assessments have shown to be effective in evaluating soccer players' speedendurance results.

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## Conflict of Interest

The authors declare that they have no conflict of interest.

## Bibliography

1. James Meschino DC, MS, ROHP. "Speed Endurance: A Major Key To Success In Sports".
2. Mohr M and Krstrup P. "Comparison between two types of anaerobic speed endurance training in competitive soccer players". *Journal of Human Kinetics* 51.1 (2016): 183-192.
3. Iaia FM., *et al.* "Four weeks of speed endurance training reduces energy expenditure during exercise and maintains muscle oxidative capacity despite a reduction in training volume". *Journal of Applied Physiology* 106.1 (2009): 73-80.
4. Živanović N., *et al.* "Effects of speed endurance test on the levels of cortisol and testosterone in handball players". *GYMNASIUM* 12.1 (2017).
5. Krstrup P, *et al.* "The Yo-Yo IR2 test: physiological response, reliability, and application to elite soccer". *Medicine and Science in Sports and Exercise* 38.9 (2006): 1666-1673.
6. Gunnarsson TP, *et al.* "Effect of additional speed endurance training on performance and muscle adaptations". *Medicine and Science in Sports and Exercise* 44.10 (2012): 1942-1948.
7. Gunnarsson TP, *et al.* "Effect of intensified training on muscle ion kinetics, fatigue development, and repeated short-term performance in endurance-trained cyclists". *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology* 305.7 (2013): R811-821.
8. Iaia FM., *et al.* "The effect of two speed endurance training regimes on performance of soccer players". *PLoS One* 10.9 (2015): e0138096.
9. Rastko Palić., *et al.* "Effects of speed endurance test on the levels of cortisol and testosterone in football players". (2020).
10. Andrasic S., *et al.* "Characteristics of speed endurance measured by modified 7x35 meters test and differences between the elite and amateur footballers" (2013).
11. Burgess K, *et al.* "Reliability and validity of the running anaerobic sprint test (RAST) in soccer players. *Journal of Trainology* 5.3 (2016): 24-29.
12. Mohr M and Krstrup P. "Comparison between two types of anaerobic speed endurance training in competitive soccer players". *Journal of Human Kinetics* 51 (2016): 183-192.

13. Papanikolaou K., *et al.* "The Yo-Yo intermittent endurance level 2 test: reliability of performance scores, physiological responses and overload characteristics in competitive soccer, basketball and volleyball players". *Journal of Human Kinetics* 67 (2019): 223-233.
14. Silva CD., *et al.* "Yo-Yo IR2 test and margaria test: validity, reliability and maximum heart rate in young soccer players". *Revista Brasileira de Medicina do Esporte* (2011).
15. Burgess K., *et al.* "Reliability and validity of the running anaerobic sprint test (RAST) in soccer players". *Journal of Trainology* 5.3 (2016): 24-29.
16. Zagatto AM., *et al.* "Validity of the running anaerobic sprint test for assessing anaerobic power and predicting short-distance performances". *The Journal of Strength and Conditioning Research* 23.6 (2009): 1820-1827.
17. Balsom PD., *et al.* "Physiological responses to maximal intensity intermittent exercise". *European Journal of Applied Physiology and Occupational Physiology* 65.2 (1992): 144-149.
18. Spigolon LM., *et al.* "Training program influences the relation between functional and neuromuscular performance indicators during the season in young soccer players". *Revista Brasileira de Ciências do Esporte* 39.1 (2017): 98-106.
19. Bangsbo J., *et al.* "Elevated muscle glycogen and anaerobic energy production during exhaustive exercise in man". *The Journal of Physiology* 451 (1992): 205-227.
20. Bangsbo J. "Energy demands in competitive soccer". *Journal of Sports Sciences* 12 (1994).
21. Bangsbo J and Lindquist F. "Comparison of various exercise tests with endurance performance during soccer in professional players". *International Journal of Sports Medicine* 13.2 (1992): 125-132.
22. Ekblom B. "Applied physiology of soccer". *Sports Medicine* (1986).
23. Sporis G., *et al.* "The anaerobic endurance of elite soccer players improved after a high-intensity training intervention in the 8-week conditioning program". *The Journal of Strength and Conditioning Research* 22.2 (2008): 559-566.
24. Berahim M and Kassim M. "Analysis of physical fitness test on junior football players". *Journal of Scientific Research and Development* (2016).
25. Bishop D and Edge J. "Determinants of repeated-sprint ability in females matched for single-sprint performance". *European Journal of Applied Physiology* 97.4 (2006): 373-379.
26. Dellal A., *et al.* "Variation of activity demands in small-sided soccer games". *International Journal of Sports Medicine* (2012).
27. Gunnarsson TP., *et al.* "Effect of additional speed endurance training on performance and muscle adaptations". *Medicine and Science in Sports and Exercise* 44.10 (2012): 1942-1948.
28. Glaister M., *et al.* "The reliability and validity of fatigue measures during multiple-sprint work: an issue revisited". *The Journal of Strength and Conditioning Research* 22.5 (2008): 1597-1601.
29. Machado FA., *et al.* "Incremental test design, peak 'aerobic' running speed and endurance performance in runners". *Journal of Science and Medicine in Sport* 16.6 (2013): 577-582.

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