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TEST RELIABILITY AND VALIDITY OF THE YO-YO INTERMITTENT RECOVERY TEST LEVEL 1 FOR ASSESSING SOCCER PLAYERS: A REVIEW STUDY

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ABSTRACT

The Yo-Yo Intermittent Recovery Test Level 1 (YYIR1) is a field-based assessment tool used globally to evaluate high-intensity, intermittent exercise capacity, a critical physiological attribute in soccer. This review study synthesizes and critically appraises the existing scientific literature to examine the validity and reliability of the YYIR1 test for soccer players. In this study systematic literature search was done through the following databases "Google Scholar, ResearchGate, PubMed and Scopus". All the relevant articles investigate the validity and reliability of the test on young soccer players between the age of 11 to 21 years and that were published in English language from 2010 to 2024 in stated databases. The articles checked the reliability of the test which were conducted on professional, high-level licensed male soccer players. In all the articles Yo-Yo IR1 was employed to measure aerobic capacity or VO2 max, as well as the total distance covered, typically reported using mean and standard deviation (SD) values. Reviewed articles revealed that analysis of reliability of the YYIR1 generally demonstrates good-to-excellent test-retest reproducibility, using mean and standard deviation (SD) values. The study concludes that the YYIR1 is a reliable and valid instrument for assessing soccer-specific endurance, provided that rigorous administration protocols are

implemented and results are interpreted within the context of the population being tested. This test was physiologically proven to be the best test to measure the Cardiovascular fitness of the soccer players of different levels. The study concluded that Yo-Yo test has excellent reliability and it is a valid test to measure aerobic capacity or VO2 max of soccer players.

KEYWORDS: Yo-Yo IR1, Soccer, Vo2 max, Aerobic capacity, Endurance.

1. INTRODUCTION

Yo-Yo Intermittent test has three variations – ‘Yo-Yo Intermittent recovery test level 1 (YYIR1), level 2 and the submaximal test’. The YYIR1 is designed to measure an individual’s ability to perform high intensity aerobic work repeatedly. The present investigation focuses on YYIR1 test. The test requires the finishing of 20-meter shuttle run in time with beep sound. After each 20-meter shuttle there is active recovery period for 10 second in the 5-meter recovery zone marked at the starting point. The test administrator monitors the recovery period and says “set” on the expiry of 7 second when the participant shall take the stationary position at the start line. Once the beep sounds again the subject will start next shuttle. In 1st missed shuttle, warning is given and, in the 2nd, consecutive missed attempt, participant is eliminated from the test. YYIR1 test lasts for 5 to 15 minutes typically. The total distance run by the participant is calculated by multiplying the number of valid shuttles to 40 meter (20 x No of shuttle) (Saville.2025) [25].

VO₂ max generally assesses the cardiorespiratory capacity. Many tests for measuring VO₂ max are available such as - Queen college step test, Cycle ergometry, Astrand treadmill test, 2.4 km run test, multistage beep test (Yo-Yo Test) etc. Among these tests, Yo-Yo test is most popular and reliable test for measuring VO₂ max. In many games and sports this test is applied to measure aerobic capacity. It is mainly used to evaluate the fitness and cardiovascular endurance capacity of an athlete. Danish soccer physiologist, Jean Bangsbo developed the Yo-Yo- test in early 1990’s. This test is a reliable and valid tool for measuring and evaluating an individual’s aerobic capacity and endurance [1]. This test has emerged as a popular measure of intermittent exercise performance, allowing coaches and researchers to quantify an athlete’s ability to recover from high intensity efforts [2]. The Yo-Yo IR1 high-intensity intermittent exercise test offers a comprehensive evaluation of an athlete’s physical fitness enabling targeted training programs to enhance performance. The test has been widely adopted in various sports providing a standardized measure of fitness and providing a basis for comparison across different population and contexts [3].

The Yo-Yo IR1 test is also a precious tool for assessing the physical demands of intermittent sports providing insights into an athlete’s ability to recover from repeated high-intensity efforts [4]. Evaluating an athlete’s fitness level is crucial for optimizing

performance and as already stated, this test offers a comprehensive assessment of cardiovascular fitness, muscular power and recovery capacity. It is a high-intensity intermittent exercise test and it is essential for evaluating an athlete’s ability to perform repeated sprints and recover from fatigue [5]. The test has become a gold standard for assessing intermittent exercise performance, providing valuable insights into an athlete’s ability to recover from repeated high-intensity efforts [1][4]. Evaluating an athlete’s fitness level is crucial for optimizing performance, and this test offers a comprehensive assessment of cardiovascular fitness, muscular power, and recovery capacity. Assessing an athlete’s ability to recover from high-intensity exercise is critical for optimizing performance, and the test provides precious insights into an athlete’s recovery capacity, informing training strategies and talent identification. [6]. This test is an essential assessment used to determine an athlete’s VO₂ max level and overall physical condition [14].

Soccer is a game that require high levels of endurance along with other physical components such as speed, agility, balance, and power [15]. Therefore, players must possess sufficient energy, endurance, and various physical fitness attributes to maintain optimal performance during matches [16]. The ability to sustain physical performance over an extended period is referred to as endurance [17]. Endurance serves as a basic component for developing good physical health and fitness and it is playing an important role not only for soccer players, but also for athletes in other sports [18]. It is a key physical attribute that should be enhanced through endurance-specific training, as it significantly supports the tactical and technical abilities of football players [19]. A high-level technique is required for good tactical performance in soccer [20][21].

The present review study aims to evaluate the validity and reliability of the YYIR1 test. The literatures reviewed shown that YYIR1 test is a valid and reliable method for measuring VO₂ max and endurance capacity of football players [16].

2. METHOD

Search Strategy and Data Source

The Systematic search of the literature was made through the following databases: Google Scholar, Research Gate, Pub Med and Scopus. The Search databases using the following keywords “Yo-Yo Test, Yo-Yo Intermittent Test, Yo-Yo Intermittent Recovery Test, Yo-Yo Intermittent Recovery Test Level-1, Yo-Yo Intermittent Endurance Test” and also some dissertation papers in similar studies like

Yo-Yo Endurance test, Yo-Yo Recovery Test Level-2 were read by the researchers. All the retrieved articles were verified and screened.

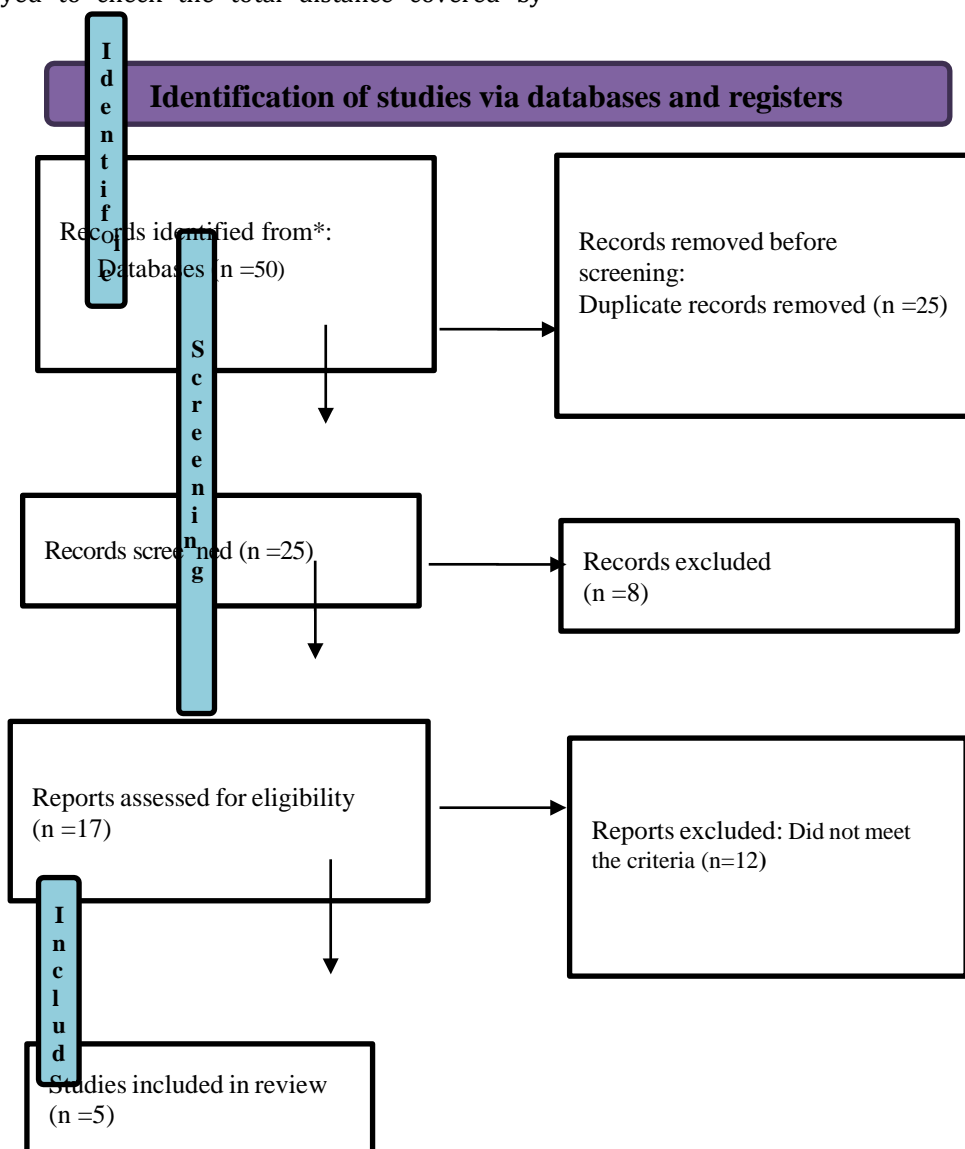
Eligibility Criteria

The study investigated the validity and reliability of the test on soccer players between the ages of 11 to 21 years who were included in this review. The referred articles were published in English from the year 2010 to 2024 in selected databases (Google Scholar, Research Gate, PubMed, Scopus). Researchers checked the distance covered by the soccer players calculated by this test (Yo-Yo Intermittent Recovery Test Level -1) and found the Mean & SD and checked the validity and reliability of the test. In all articles referred by the researcher Yo-Yo Intermittent Recovery Test Level -1 was employed to check the total distance covered by

calculating the Mean and SD. The extract of this review study would likely to help the coaches and trainers to select players based on their fitness level and coaches can easily identify their endurance capacity and VO2 max level.

Study Selection and Data Extraction

The process of searching and selecting all the studies were individually performed by researchers. Reading of many articles and abstracts from the databases were made by the researchers and all the duplicate papers, research papers with similar digits of statistical figures & irrelevant papers were discarded. Every paper was read in complete including the abstracts; selected some experimental research articles which were considered for analysis and examination.



PRISMA flow diagram

3. RESULT

Study Selection

All the studies were searched from databases of Google Scholar, ResearchGate, PubMed, Scopus etc. Total 50 papers were initially selected and read. Out of 50 papers, 25 papers were excluded from the review because authors presented duplicate data in these papers. These data were used in previous research, and also the same content was published in other journals. Out of remaining 25 papers, 8 papers were excluded after reading the abstracts, because the test selected by the present researchers was not matched with the tests employed in those 8 papers. So, 17 papers were selected and again from 17 papers, 12 papers were excluded because the criteria did not match with the criteria of the present review. Finally, the total number of selected papers was only 5.

Study Characteristics

Most of the selected articles examined the reliability of the test employed to assess the cardiovascular endurance and intermittent recovery

ability. The subjects of these studies were mostly professional high-level licensed male soccer players. The articles selected for analysis were published between the year 2010 and 2024. All studies utilized the Yo-Yo Intermittent Recovery Test Level 1 (Yo-Yo IR1) to measure aerobic capacity or VO₂ max, as well as the total distance covered, typically reported using mean and standard deviation (SD) values.

Participants

The total population size was 505 and mostly the age group of the subjects was 11 to 21 years. Researchers classified the selected studies in three categories. In category 1, 1 study was included according to the age group of the subjects [8]. In category 2, 2 studies were included according to the players level (Elite, Sub elite, and non-athletic healthy male) [7][10]. In category 3, 2 studies were included based to the player's position of the play [9] [11]

Following table (Table -1) depicts the finding and conclusions of the studies which were finally selected for analysis.

Table 1: Findings and conclusions of the selected studies.

Author Name/ YEAR	Duration	Subjects	Groups	Mean & SD	Age Group	Result
1. Deprez D et.al, (2014)	YYIR1 3 WEEKS	36 SOCCER PLAYERS- U15-22 players, U17-10 players and U19- 4 players	3 GROUPS (U15, U17, U19)	Mean of YYIR1 performances of the U15, U17 and U19 age groups were 2024 ± 470 m, 2404 ± 347 m, and 2475 ± 347 m, respectively	13-18 Years	The results revealed that the Typical Errors varied between 74 and 172 m, Coefficients of Variation (CVs) between 3.0 and 7.5%, and Intraclass Correlation Coefficients (ICCs) was between 0.87 and 0.95 across all age groups for this test. The test performance and the physiological responses have proven to be highly reliable in a sample of Belgian high-level soccer players, age range 13 to 18 years.
2. Deprez D et.al, (2015)	YYIR1 2 WEEKS	Total population size was 228. (ELITE) level (1st division; n = 150), (SUB-ELITE) level (2nd and 4th division; n = 58) and (NON-ELITE) level(n=20)	Age groups- (U13 and U15) and (U17)	The means and standard deviation of Yo-Yo IR1 distance for each age groups were 890 ± 354 m, 1022 ± 444 m and 1556 ± 478 m respectively	11-17 years	Significant differences (P < 0.001) were found in the Yo-Yo IR1 performance among elite (U13: 1270 ± 440 m, n = 44; U15: 1818 ± 430 m, n = 57; U17: 2151 ± 373 m, n = 49) and sub-elite (965 ± 378 m, n = 31; U15: 1425 ± 366 m, n = 31; U17: 1640 ± 475 m, n = 11) youth soccer players.

3. James P. Veale et.al, (2010)		Sixty (60) participants spread over three groups (elite, $n = 20$; sub-elite, $n = 20$; non-athletic healthy males, $n = 20$).	Three groups (elite, $n = 20$; sub-elite, $n = 20$; non-athletic healthy males, $n = 20$).	Elite group: $1910^* \pm 230$ sub-elite group: $1438^{\wedge} \pm 335$ non-athletic healthy males: 774 ± 358 respectively	16-18 years	An one-way ANOVA with Scheffe's post hoc analysis revealed that the elite junior footballers had a significant higher value in total distance covered ($p < 0.001$) and a significant greater value in number of high-intensity efforts made ($p < 0.001$) in comparison to their sub-elite counterparts, whilst both, elite and sub elite groups performed significantly better ($p < 0.001$) than the non-athletic healthy males.
4. Goran Markovic and Pavle Mikulic (2011)		One-hundred and six (106) prospective young male soccer players (goalkeepers excluded).	Age groups U13 to U19	Cornerbacks ($1,213 \pm 407$ m) had significantly (all $p < 0.01$) lower adjusted performance scores than centre midfielders ($1,539 \pm 672$ m), wide midfielders ($1,504 \pm 492$ m), and forwards ($1,472 \pm 526$ m), but not fullbacks ($1,375 \pm 505$ m) respectively	12-19 years	The ANOVA identified significant differences ($F = 25.3$; $p < 0.001$; Cohen's $d = 2.84$; observed power = 0.99) among age categories in Yo-Yo IR1. The ANCOVA identified significant differences ($F = 3.1$; $p < 0.019$; Cohen's $d = 0.42$; observed power = 0.80) in Yo-Yo IR1. The Yo-Yo IR1 test proved to be valid, reliable, and easily available measurement tool of a player's soccer-specific endurance capacity.
5. Serdar Bayrakdaroğlu, et.al, (2020)		75 young soccer players at 5 different playing positions participated in study voluntarily (cornerback: $n=15$, fullback: $n=15$, midfielder: $n=15$, winger: $n=15$, forward: $n=15$). The	(cornerback: $n=15$, fullback: $n=15$, midfielder: $n=15$, winger: $n=15$, forward: $n=15$).	Midfielders covered more distance ($2425,33 \pm 440,42$ m) than forward ($2146,67 \pm 339,64$ m), winger ($2137,33 \pm 615,18$ m), fullback ($2056,00 \pm 512,43$ m) & cornerback ($1960,00 \pm 313,51$ m) respectively	Playing U-21 category	No significant difference was observed between young soccer players at different playing positions in terms of the VO ₂ max, covered distance and maximum aerobic speed (MAS) values. The analysed results indicated that the midfielders had the highest test values than soccer players of other playing positions.

In this present review players' age range was mostly between 11- 21 years and few are below the stated age group. Researcher finally selected five studies for analysis based on three different criteria, such as age groups of the subjects, position of play

and players' level of participation. In all the studies every subject performed YYIR1 test.

In the study conducted by **Deprez D et.al, (2014)** total number of players was 36 who performed the YYIR1 test. To analyse the effect of YYIR1 test on 36

subjects of three age groups, the Mean and SD values were considered, which were 2024 ± 470 m, 2404 ± 347 m, 2475 ± 347 m) for the U-15, U-17 and U-19 groups respectively [8].

In the study conducted by **Markovic, G., & Mikulic, P (2011)**, the position wise data of YYIR1 test of Centre back, Mid fielder, Forward, Fullback, Wingers, Cornerbacks and Goalkeepers were taken into consideration for analysis. Mean and SD of 106 subjects in the positions of Cornerbacks, Centre midfielder, Wide Midfielder, Forward and Fullback were 1213 ± 407 m, 1539 ± 672 , 1504 ± 492 , 1472 ± 526 , and 1375 ± 505 respectively [9]. In the study conducted by **Serdar Bayraktaroglu, et.al (2020)** on 75 young soccer players of 5 different playing positions such as Midfielder, Forward, Wingers, Fullback and Cornerback, Mean and SD were $2,425.33 \pm 440.42$ m, $2,164.67 \pm 339.64$ m, $2,137.33 \pm 615.18$ m, $2,056.00 \pm 512.43$ m, and $1,960.00 \pm 313.51$ m, respectively [11].

In the study undertaken by **Deprez D et.al, (2015)** on 228 subjects according to their level of participation, such as Elite Level, Sub-Elite Level and Non-Elite groups and the Mean and SD values of YYIR1 test were 890 ± 354 m, 1022 ± 444 m and 1556 ± 478 m respectively [7]. In another study conducted by **James P. Veale et.al, (2010)** on 60 subjects out of which 20 players belonged to Elite level, another 20 to Non-Elite Level and remaining 20 to the Non-Athletic Healthy Male groups, Mean and SD values of YYIR1 performances were 1910 ± 230 , 1438 ± 335 and 774 ± 358 for Elite, Sub elite and non-athletic healthy male groups respectively [10].

4. DISCUSSION

Present review study investigates reliability and validity of the YYIR1 test. This test was physiologically indicated to be highly reliable for soccer players belonged to the age between 13 to 18 years of Belgian Elite Youth Soccer players [7]. Also, that YYIR1 test was proven to be reliable in the age groups of U13 and U15 and highly reliable in the age group of U17 players [8]. This test was highly valid and reliable to measure the intermittent aerobic performance capacity of young football players and it can be used to measure sports -specific endurance capacity [9]. This test was very highly prominent test to measure performance abilities of elite junior players [10]. The performance of the midfielders had larger aerobic capacity than other players. The young midfielders covered more distance in Yo-Yo IRT1 test

than other playing position [11]. The test was reliable and easier to conduct on large number of players at the same time. This test was good method to compare aerobic or endurance capacity and performance capacity of players. This test is best endurance assessment tool for measuring endurance capacity of young and adult soccer players [12]. The sub elite male winger soccer players covered more distance than attacker and fullback players. Elite midfielders covered more distance than centre back, fullback, and attacker soccer players [4]. 23 years male midfielder soccer players covered more distance on test performance than defenders and midfielders [13]. This test has been established as a valid and reliable tool for measuring aerobic fitness and game-related endurance among basketball players [1]. Besides, this analysis-based research has identified that YYIR1 test is a relevant measure of intermittent high-intensity endurance in male handball players [22]. Similarly, many studies have showed its effectiveness in evaluating VO₂ max levels among both cricket and basketball players [23]. In addition, performance outcomes have confirmed that Yo-Yo test provides a highly reliable and valid assessment of endurance capacity among soccer players belong to different age groups [24].

5. CONCLUSION

The study concludes that Yo-Yo test is highly reliability and it is a valid test to measure VO₂ max capacity of soccer players. Most of the finding reported that the reliability and validity of the test were checked. The outcomes of these present reviews proves that YYIR1 test is highly reliable test for the age group of 11 to 21 years and above soccer players. This test has been physiologically proven that it is the best test to measure cardiovascular fitness as well as cardio respiratory capacity of the soccer players of different performance level. For athletes from other intermittent, high-intensity sports such as basketball, handball, and rugby this test is the best test to measure their VO₂ max or aerobic capacity. Due to its practical design, ease of use, and least involvement of specific equipment, this test serves as an efficient method for tracking athletic fitness and supporting training strategies across various sports disciplines. As a result, coaches and sports professionals can effectively utilize the test to assess and enhance the physical conditioning of athletes in both team-based and individual sports.

REFERENCE

1. Castagna, C., Impellizzeri, F. M., Rampinini, E., D'Ottavio, S., & Manzi, V. (2008). The yo-yo intermittent recovery test in basketball players. *Journal of science and medicine in sport*, 11(2), 202-208.

- <https://dx.doi.org/10.1016/j.jsams.2007.02.013>
2. Krstrup, P., Mohr, M., Amstrup, T., Rysgaard, T., Johansen, J., Steensberg, A., ... & Bangsbo, J. (2003). The yo-yo intermittent recovery test: physiological response, reliability, and validity. *Medicine & science in sports & exercise*, 35(4), 697-705. <https://doi.org/10.1249/01.MSS.0000058441.94520.32>
 3. Bangsbo, J., Iaia, F. M., & Krstrup, P. (2008). The Yo-Yo intermittent recovery test: a useful tool for evaluation of physical performance in intermittent sports. *Sports medicine*, 38, 37-51. DOI:10.2165/00007256-200838010-00004
 4. Mohr, M., Krstrup, P., & Bangsbo, J. (2005). Fatigue in soccer: a brief review. *Journal of sports sciences*, 23(6), 593-599. DOI: 10.1007/s00421-009-1221-4
 5. Spencer, M., Bishop, D., Dawson, B., & Goodman, C. (2005). Physiological and metabolic responses of repeated-sprint activities: specific to field-based team sports. *Sports medicine*, 35, 1025-1044. <https://doi.org/10.2165/00007256-200535120-00003>
 6. Rampinini, E., Sassi, A., Azzalin, A., Castagna, C., Menaspà, P., Carlomagno, D., & Impellizzeri, F. M. (2010). Physiological determinants of Yo-Yo intermittent recovery tests in male soccer players. *European journal of applied physiology*, 108(2), 401-409. <https://doi.org/10.1007/s00421-009-1221-4>
 7. Deprez, D., Franssen, J., Lenoir, M., Philippaerts, R. M., & Vaeyens, R. (2015). The Yo-Yo intermittent recovery test level 1 is reliable in young high-level soccer players. *Biology of sport*, 32(1), 65-70. <https://doi.org/10.5604/20831862.1127284>
 8. Deprez, D., Coutts, A. J., Lenoir, M., Franssen, J., Pion, J., Philippaerts, R., & Vaeyens, R. (2014). Reliability and validity of the Yo-Yo intermittent recovery test level 1 in young soccer players. *Journal of Sports Sciences*, 32(10), 903-910. <https://doi.org/10.1080/02640414.2013.876088>
 9. Markovic, G., & Mikulic, P. (2011). Discriminative ability of the yo-yo intermittent recovery test (level 1) in prospective young soccer players. *The Journal of Strength & Conditioning Research*, 25(10), 2931-2934. <https://doi.org/10.1519/JSC.0b013e318207ed8c>
 10. Veale, J. P., Pearce, A. J., & Carlson, J. S. (2010). The Yo-Yo intermittent recovery test (level 1) to discriminate elite junior Australian football players. *Journal of Science and Medicine in Sport*, 13(3), 329-331. <https://doi.org/10.1016/j.jsams.2009.03.006>
 11. Bayrakdaroğlu, S., Arı, E., Özkamçı, H., & Can, I. (2020). The examination of Yo-Yo intermittent recovery test performance of young soccer players at different playing positions. *Physical education of students*, 24(4), 235-241. <https://doi.org/10.1519/JSC.0b013e3181bac463>
 12. Karabulak, A., & Özcan, S. (2024). Examining the Relationship Between Yo-Yo Intermittent Rest Test Results and Performance in Football Players. *Turkish Journal of Sport and Exercise*, 26(2), 230-235. <https://doi.org/10.15314/tsed.1496858>
 13. Sparks, M., Coetsee, B., & Gabbett, J. T. (2016). Yo-Yo Intermittent Recovery Test thresholds to determine positional internal match loads of semi-professional soccer players. *International Journal of Performance Analysis in Sport*, 16(3), 1065-1075. <https://doi.org/10.1080/24748668.2016.11868948>
 14. Suryadi, D., Yanti, N., Tjahyanto, T., Ramli, & Rianto, L. (2023). Yo-Yo Intermittent Recovery Test: A study of football players' VO₂max physical condition. *Journal Sport Area*, 8(2), 141-150. [https://doi.org/10.25299/sportarea.2023.vol8\(2\).12392](https://doi.org/10.25299/sportarea.2023.vol8(2).12392)
 15. Syukur, A., & Soniawan, V. (2015). The Effects of Training Methods and Achievement Motivation Toward of Football Passing Skills. *IPES-Journal of Indonesian Physical Education and Sport*, 1(2), 73-84. <https://doi.org/10.21009/JIES.012.07>
 16. Hardinata, R., Gustian, U., & Perdana, R. P. (2021). The Effectiveness of the Triangle Run Exercise Method in Improving Aerobic Resistance Soccer Player. *JUARA: Jurnal Olahraga*, 6(1), 115-124. <https://doi.org/10.33222/juara.v6i1.1180>
 17. Tudor, B. O., & Michael, C. (2015). Conditioning Young Athletes. *Human Kinetics*. https://books.google.co.in/books/about/Conditioning_Young_Athletes.html?id=SPR6DwAAQBAJ&redir_esc=y
 18. Nesra Barus, J. B. (2020). Tingkat Daya Tahan Aerobik (VO₂max) Siswa Ekstrakurikuler Gulat di SMA Negeri 1 Barusjahe Kabupaten Karo. *KINESTETIK*, 4(1), 108-116. <https://doi.org/10.33369/jk.v4i1.10649>
 19. Warni, H., Arifin, R., & Bastian, R. A. (2017). Pengaruh Latihan Daya Tahan (Endurance) terhadap Peningkatan VO₂max Pemain Sepakbola. *Multilateral Jurnal Pendidikan Jasmani dan Olahraga*, 16(2), 121-162. <https://doi.org/10.20527/multilateral.v16i2.4248>

20. Syahda, I. A., Damayanti, I., & Imanudin, I. (2016). Hubungan Kapasitas Vital Paru-Paru dengan Daya Tahan Cardiorespiratory pada Cabang Olahraga Sepakbola. *Jurnal Terapan Ilmu Keolahragaan*, 1(1), 24-28. <https://doi.org/10.17509/jtikor.v1i1.1549>
21. Allsabab, M. A. H. (2021). Survei Kapasitas Daya Tahan Aerobik (VO₂max) pada Pemain Sepakbola Persik Usia 20 Tahun. *Jurnal Kejaora (Kesehatan Jasmani dan Olah Raga)*, 6(1), 174-180. <https://doi.org/10.36526/kejaora.v6i1.1260>
22. Souhail, H., Castagna, C., Yahmed Mohamed, H., Younes, H., & Chamari, K. (2010). Direct validity of the yo-yo intermittent recovery test in young team handball players. *The Journal of Strength & Conditioning Research*, 24(2), 465-470. <https://doi.org/10.1519/JSC.0b013e3181c06827>
23. Mirani, M., Kapopara, A., Rathod, S., & Bachkaniwala, A. (2021). To Compare the Performance of \YO-YO Intermittent Recovery Test Level-1 in Recreational Basketball and Cricket Players. *International Journal of All Research Education and Scientific Methods*,9(11). DOI:10.5281/zenodo.5928890
24. Kusuma, K. C. A., Artanayasa, I. W., & Lesmana, K. Y. P. (2025). Yo-yo intermittent recovery test level 1 for young soccer player: Test-retest reliability. *Jurnal Keolahragaan*, 13(1), 10-17. <https://doi.org/10.21831/jk.v13i1.78879>
25. Saville. Will, (2025), YO-YO Intermittent Recovery Test Level-1. <https://www.scienceforsport.com/yo-yo-intermittent-recovery-test-level-1>