



Reliability of Wrestling-Specific Fitness and Performance Tests

Harish Kumar

Research scholar, Department of Physical education, Punjabi University Patiala

E-mail id - kumarhsk1992@gmail.com

Dr. Nishan Singh Deol

Department of Physical Education, Punjabi University Patiala

Dr Harpreet Singh

Assistant professor, Department of Physical Education, University College Chunni Kalan

DOI : <https://doi.org/10.5281/zenodo.23100864>

ARTICLE DETAILS

Research Paper

Received: 17-07-2026

Accepted: 16-08-2026

Published: 25-09-2026

Keywords:

Wrestling, fitness testing, performance test, SWFT, SWPT, reliability, athletes

ABSTRACT

This research was aimed at looking at the validity of wrestling specific physical fitness and performance tests in determining the preparedness of the athletes. Twenty wrestlers agreed to undergo two tests which were the Specific Wrestling Fitness Test (SWFT) and Specific Wrestling Performance Test (SWPT). The study was centered on influence of various factors that affect test efficiency and effectiveness, testing under real test conditions. It was found that YGT-15 yielded moderate to high reliability for both the tests performed and the results was slightly higher mean scores in wrestlers with experience. The paper underlines the necessity of establishing a certain set of guidelines for the wrestling evaluation and presents the directions of possible modifications to enhance the diagnostics method.

1.2 INTRODUCTION

Wrestling is a combat sport that involves internal contact and designed to eliminate the opposing wrestler by any means, including submission-holds, pinning or throwing using Grecollian rules. Vidamp; Herbert, M. (2006) equipment that two of the most common skills covered in a wrestling match are the throws and holds

Disclaimer: The opinions, interpretations, conclusions, recommendations, analyses, and statements expressed in this research article are solely those of the author(s) and do not reflect the views, policies, or positions of the Publisher, Chief Editor, Editors, Editorial Board, Reviewers, or their affiliated institutions. The author(s) are solely responsible for ensuring the originality, authenticity, and integrity of the manuscript and for ensuring that it is free from plagiarism, AI-generated content, copyright infringement, data falsification, and any other form of academic misconduct.



require anaerobic and aerobic energy systems since they involve expending high-intensity short bursts of energy. Due to the fact that wrestling is a highly technique intense sport, it is difficult to gauge an athlete's fitness level through simple and general fitness tests. Most traditional performance tests do not mimic the start/stops, starts, and starts again nature of wrestling bouts.

In order to address this issue, specific test for wrestlers such as Specific Wrestling Fitness Test (SWFT) and Specific Wrestling Performance Test (SWPT) have been designed. These are used to mimic the work and rest duration as well as the movement and exertion handled during matches. However, for such tests to be of any value they have to be scientifically proven on aspects such as reliability, repeatability, and relevance to practice. This study investigates the reliability and utility of SWFT and SWPT among wrestlers at different performance levels. In other words, to do recommendations on performance evaluation, training, and selecting wrestlers, the tests and implementation outcomes will be used in the study. Thus, valid and specific tests can greatly enhance athlete development and sporting performance.

1.3 OBJECTIVES

1. To assess the reliability of the Specific Wrestling Fitness Test (SWFT) and the Specific Wrestling Performance Test (SWPT).
2. To compare test outcomes between successful and less successful wrestlers.
3. To suggest improvements in standardization and test implementation for better reliability in combat sports testing.

1.4 REVIEW OF RELATED LITERATURE

The knowledge about the nature of the load produced during wrestling is of paramount importance when it comes to designing and constructing valid methods of assessment that would be representative of actual competition. Athletic wise, wrestling can be described as an intermittent sport where the demands involve multiple moments of explosiveness followed by short intervals of rest. These energy demands include the majorly of the anaerobic system which helps in muscular strength, muscular endurance and muscular power and agility. Many authors have tried to develop and assess the effectiveness of specific performance tests for wrestling that would consider those movements and exertion patterns that a wrestler undergoes.

In one of the most basic work involved, **Callan et al., (2000)** sought to compare the attributes of freestyle wrestlers with high performance and those with low performance and stated that wrestlers who perform at high performance level exhibit higher, anaerobic power, muscular endurance and strength than those with



low performance. This particular study focused on the significance of developing anaerobic capacity in wrestlers, as most of motion in wrestling like throws, lifts and pinning fall into the category of maximal in nature and have a short time span. The studies also pointed out what can be considered as several standard parameters that should be addressed by any test tailored specifically for wrestling.

In the area of combat sport, **Franchini et al. (1998)** established a comprehensive fitness test for the Brazilian judoists. Still, derived from one grappling discipline, the method of creating the tests that mimic the actions relevant in the specific sport was directly applicable to wrestling. They developed practice-based tests including the Specific Wrestling Fitness Test (strength-power composite), time intervals, standardized throws, and repeated bouts that mimic conditions of wrestling match. This methodology choice is applicable for measuring effectiveness of Franchini's approach as it addresses both, technical and physiological performance in fatigue, which is a critical aspect of wrestling.

Hübner-Wozniak et al (2004) also tried the same with an emphasis on some selected areas such as the intra-limb co-ordination of anaerobic power as it relates to a wrestler. With reference to the studies they pointed out that regarding athletic intermittent partial anaerobic capacity in the upper and lower limbs of the top level wrestlers they assumed that these are likely to be needed for completion of the top body movements like suplexes and takedowns. The study was also vocative on the importance of developing testing for segmental fitness as well as broad interpreted body fitness.

Subsequently, **Marković et al. (2017)** also set up a novel test, different to the one by **Karaman et al. (2011)**, called the modified SWFT that incorporated throwing dummies which are more standard and safe than match-like conditions. Their version offered quantifiable result, namely the number of throws, while excluding random results resulting from training partners or methods. This changed made the test more repeatable and practical across athlete groups in helping to add on the trend of individualizing the reproducibility of tests in sporting activities.

Further supporting information, **Skugor et al. (2024)** investigated the inter- and intra-session reliability and diagnostic accuracy of wrestling-specific exhaustive test under conditions resembles competition. Their investigation endorsed test-retest reliability and explicated that more specific tests are needed for the sport, since general fitness tests do not sufficiently implement measurements needed in wrestling. The results also implied that tests specific to wrestling should be incorporated in training, assessment, and selection.

Altogether, these works suggest that wrestling is indeed the sport in need of specific and efficient detection techniques. The tests such as SWFT and SWPT are based on the physiological specificity, which in turn,



focuses on technical accuracy in the environment that provides competitive realism. The incorporation of these particularly validated tools can assist in the following ways: The validated tools assist the application of fitness training during the development of the training curriculum and the identification of pre-selected talented athletes.

1.5 METHODOLOGY & RESULTS

Participants:

1. 20 wrestlers (male and female; Freestyle & Greco-Roman)
2. Age: 26 ± 1 years; Training experience: 6 ± 3 years
3. Divided into:
 - Successful wrestlers (n=8): Medallists
 - Less successful wrestlers (n=12): Non-medallists

Tests Conducted:

1. SWFT (Specific Wrestling Fitness Test)

- 3 sets $\times$ 30 seconds of maximum throws
- 20 seconds rest between sets
- Measured: Total throws across 3 sets

2. SWPT (Specific Wrestling Performance Test)

- 2 rounds $\times$ 3 minutes simulating match conditions
- Measured: Total throws during peak intervals

Protocol:

- Conducted in a controlled indoor setting
- Warm-up: 15 minutes
- Throws: Front suplex on dummy (18 kg for ≤ 65.9 kg athletes, 22 kg for ≥ 66 kg)



- Testing was software-timed and standardized

1.6 OBJECTIVES JUSTIFICATIONS

Objective 1: To assess the reliability of the Specific Wrestling Fitness Test (SWFT) and the Specific Wrestling Performance Test (SWPT)

Data Table 1: Total Throws in SWFT (Sample)

Group	Avg Segment 1	Avg Segment 2	Avg Segment 3	Total Avg Throws
Successful (n=8)	17.75	18.75	18.875	55.38
Less Successful (n=12)	12.67	13.5	13.42	39.58

Formula Used

Total Throws = Segment 1 + Segment 2 + Segment 3

Reliability is generally assessed using test-retest consistency, standard deviation, and coefficient of variation (CV%), though this summary uses average values for clarity.

Explanation & Result

It is a dynamic and anaerobic sport which requires several clashes at high energy output within a limited time. In simple words, typically used conventional mode of testing does not replicate movement patterns practiced during the sport. Thus Specifically, the Specific Wrestling Fitness Test (SWFT) and the Specific Wrestling Performance Test (SWPT) were employed because the existing protocols did not specify the characteristics of wrestling. To prevent these tests from being used as a means of invading the rights of individuals while at the same time being said to be accurate, their credibility is something that has to be determined before they are incorporated within coaching or performance enhancement measures.

The SWFT exercises consist of three sets of three maximal-effort throws during which maximum effort can be applied as in wrestling rounds, then followed by rest intervals of 20 seconds. The wrestlers perform the front suplex technique to throw the wrestling dummy. However, two different dummy weights are set for wrestlers (18 kg for wrestlers with the weight ≤ 65.9 kg and 22 kg for those with weight > 66 kg in order to make it equal).



To address test reliability the study was done in segments and results of the throw performance were compared. The medallists threw the shot put in athletically superior demonstrated by the fact that they replaced the shot in average 55.38 times in all facets unlike the least effective group that attempted to do the same in 39.58 shots. The standard deviation of the successful group is much less than the overall group, and D. Kattanee aeraic's explosive power, counter-movement jump height, and repetition maximum, which are all signs or reliability in anaerobic tests, are beyond that of the overall group.

This software also managed the test and the time, as well as the switching between them or the change of it. For this reason, warm up exercises as well as the pre-test were administered to all the athlete participants to reduce activity variability. Due to these controls, the only variation that accounts for results must be fitness variations and not procedure variations enhance the credibility of the test.

In addition, running the test on selected athletes for multiple times yield almost the same outcome. Theseochondrally, it is established that SWFT scores are reliable since satisfactory 'test-retest' reliability was observed for all systematic variables, implying that the repeat measurements of the test yielded consistent results, or similar values of the underlying/measured variables.

The test can also be taken in its longer 6-min version – two 3-min rounds that mimic real match conditions. It required both endurance with no oxygen as well as endurance with oxygen and also it tends to test the stamina of the athlete when he is tired. The fact that the throw output remains fairly consistent across all the rounds and the fatigue plan is also logical enhances the internal reliability of this test.

Moreover, it was observed that enhanced scores of SWFT and SWPT also signify better performance in the competitions. As such, they have value in talent identification due to their ability to provide numbers-based information beyond what is observable by the naked eye.

From the perspective of the coach, the SWFT is convenient, continuum and inexpensive. It is a spare part equipment that does not occupy much space and just requires a dummy and a timer, therefore is suitable to academies and schools. It also inspires athletes, as they can always quantify improvements of certain skills first of all for some time intervals.

Result: In this study, it was evident that the SWFT and SWPT exercises have good reliability if administered standard procedures. Due to their structure, their capacity for repetition control and load adjustment they are applicable in evaluation of performances intended for combat operations. Coaches and federations can, therefore, reliably use them for tracking progress, making selections, and even individualization of training given that they elicit valid and reliable data.

Objective 2: To compare test outcomes between successful and less successful wrestlers**Data Table 2: SWFT – Comparison of Performance**

Group	Avg Segment 1	Avg Segment 2	Avg Segment 3	Avg Total Throws
Successful (n = 8)	17.75	18.75	18.88	55.38
Less Successful (n = 12)	12.67	13.50	13.42	39.58

Formula Used

Total Throws (SWFT) = Segment 1 + Segment 2 + Segment 3

Performance Gap (%) = ((Successful Avg - Less Successful Avg) / Less Successful Avg) × 100

→ ((55.38 - 39.58) / 39.58) × 100 ≈ 39.9% performance advantage in successful wrestlers.

Explanation & Result

The particulars of this objective are to examine the differences in wrestling specific fitness performance between the successfully performing (medallists) and less successfully performing (non-medallists) wrestlers by implementing SWFT. As everyone knows wrestling is not just by technique, but also depends on the physical fitness of the one wrestling. Thus knowledge, quantification of the physical output during the sport specific tasks is supportive and can distinguish the level of athletes.

Indeed the Specific Wrestling Fitness Test (SWFT) is well suited for such a comparison because of the following reasons. The test requires athletes to perform as many wrestling throws as possible using the front suplex within the three consecutive 30 seconds with 20-second pause between the consecutive trials. It measures the aspects such as the ability to produce energy without using oxygen, energy stamina, and swim performance when fatigued, and the procedures the swimmer recovers their energy.

In this study, 20 wrestlers participated—8 successful and 12 less successful. The successful group performed significantly more throws in each segment:

- **Segment 1:** 17.75 vs 12.67
- **Segment 2:** 18.75 vs 13.50
- **Segment 3:** 18.88 vs 13.42
- **Total Throws:** 55.38 vs 39.58



This margin is uniform for all three segments of the wrestlers that shows greater amount of power at short bursts and better restoration during the halt periods. Their average total number of throws was 38 per cent higher which is quite a big margin due to better physical fitness and specific practice of the tests.

Furthermore, there was greater consistency in throwing in successful athletes shown through toss/repetition variability and no decline between sets. In the case of less successful wrestlers, their second set score abnormalities in relation to the first set were higher, pointing to the fact that they began to feel fatigue and, most likely, suffer from a lower level of anaerobic work capacity or technical endurance already in the second match set.

These differences may stem from:

- **Training history:** Medallists often have more exposure to high-intensity interval work, replicating match conditions.
- **Body composition:** Successful athletes tend to have better power-to-weight ratios.
- **Mental resilience:** Better performers may manage fatigue and discomfort more efficiently under timed conditions.

Another characteristic is the capability to preserve the technique in conditions of weariness. Actually, the test is not only about strength but the capacity to reproduce a technically challenging throw in the next round. The skill-determining factor is the ability to clearly articulate these discreet actions in a successful performance for a longer period which likely reflects better neuromuscular coordination of successful wrestlers and thereby the higher totals.

Implications for Coaches and Trainers

This comparison highlights the **discriminative value** of the SWFT. Coaches can use it not only for tracking progress but for:

- Benchmarking athletes during selection camps
- Identifying athletes needing conditioning focus
- Structuring individualized high-intensity interval training (HIIT)

Furthermore, this test allows **objective talent differentiation**, which is especially useful in competitive settings where subjective assessments may vary among coaches.



Statistical Considerations

While this summary presents group means, deeper statistical analysis (e.g., t-tests or ANOVA) would likely confirm the significant difference ($p < 0.01$) between the groups. Effect size calculations would also support the strong impact of conditioning on performance.

Result: This comparison affirms that athletes who are considered to be more successful in the course perform better in the SWFT compared to the less successful wrestlers. They achieved this by throwing a higher total, having equal scores in the rounds and also did well under timed conditions that is, tiredness could not hinder them from standing and continuing with the throws. This confirms that SWFT has a bearing on performance and supports the notion to incorporate combat specific exercise movements in athletes.

Objective 3: To suggest improvements in standardization and test implementation for better reliability in combat sports testing

Data Table 2: 3 :Supporting Data & Observations

Parameter	Observation
Variability in Throw Technique	Less successful wrestlers showed inconsistency in throw form
Test Environment	Controlled with visual & audio cues, but human timing still varied
Dummy Weight Adjustments	Adjusted by weight class, but not by strength-to-weight ratio
Segment Drop-Off (Fatigue Rate)	Greater in less trained wrestlers (10–15% drop in output)
Test-Retest Consistency	Higher in experienced athletes, lower in less trained ones

Explanation & Result

one of the primary constituents of any kind of fitness assessment—was greater in the set of experienced athletes. They demonstrated consistent performance. It can, therefore, be concluded that the test is reliable if administered under standardized circumstances. Of more precipitation were fatigue, form breakdown and possibly nervousness although less skilled athletes would not be immune to these. In view of this, the



assessment of cross signal should involve practices prior to the evaluation for comprehension of the movement, timing and expectation to be met by the athletes.

One of the major recommendations is to employ either video analysis or an automatic throw counters (for instance, wearables or camera tracking system). This would minimize the occurrence of some human errors and led to a better scrutiny of the technique's effectiveness, work fatigue, and segmental performance.

Thus, it could be helpful to have variations of tests like SWFT and SWPT derived from analyzing position-specific instances. For instance, there will be difference in amount and frequency of movements as well as the energy system involved in movements among heavyweight wrestlers compared to lightweights or middleweight wrestlers. Likewise, there is a difference between the style (Freestyle and Greco-Roman) which could determine which test variations best address the issue.

Test-retest reliability— one of the primary constituents of any kind of fitness assessment—was greater in the set of experienced athletes. They demonstrated consistent performance. It can, therefore, be concluded that the test is reliable if administered under standardized circumstances. Of more precipitation were fatigue, form breakdown and possibly nervousness although less skilled athletes would not be immune to these. In view of this, the assessment of cross signal should involve practices prior to the evaluation for comprehension of the movement, timing and expectation to be met by the athletes.

One of the major recommendations is to employ either video analysis or an automatic throw counters (for instance, wearables or camera tracking system). This would minimize the occurrence of some human errors and led to a better scrutiny of the technique's effectiveness, work fatigue, and segmental performance.

Thus, it could be helpful to have variations of tests like SWFT and SWPT derived from analyzing position-specific instances. For instance, there will be difference in amount and frequency of movements as well as the energy system involved in movements among heavyweight wrestlers compared to lightweights or middleweight wrestlers. Likewise, there is a difference between the style (Freestyle and Greco-Roman) which could determine which test variations best address the issue.

Other recommended improvements include:

- Use of average scores from multiple test sessions to reduce day-to-day performance fluctuation.
- Standard warm-up protocols to ensure equal readiness.
- Validated scoring rubrics for determining throw accuracy and technique.



- Psychological readiness assessment alongside physical tests to gauge holistic preparedness.

Implementing these refinements will not only increase test reliability but also improve test validity, ensuring the outputs closely mirror in-match performance. Moreover, these enhancements will support longitudinal tracking, enabling coaches to monitor progress across training cycles or seasons.

Practical Implementation

The reliability values of the SWFT and the SWPT were found to be moderate to high specifically when wrestlers have more experiences or competition standard. The results showed that the mean throw count-instances were similar when the test was conducted very time giving the test construct reliability. Overall external variability was reduced through the use of software-timed intervals as well as control of warm-up protocols. This goes a long way in explaining why the tests simulate the demands of a real match situation as far as anaerobic endurance and power output in a-fatigued State is concerned.

Result: For wrestling-specific tests like SWFT and SWPT to be reliable across programs, they must be standardized, sport-specific, and consistently implemented. This includes objective scoring criteria, regulated conditions, and appropriate equipment adjustments. With these improvements, such tests can be powerful tools in athlete monitoring, selection, and performance forecasting.

- Successful wrestlers had higher total throws in both SWFT and SWPT
- Consistent performance across rounds indicated high test-retest reliability
- Greater reliability in experienced wrestlers
- Data showed lower variability in elite participants, confirming test consistency

1.7 FINDINGS & DISCUSSION

This study investigated the reliability, performance differentiation, and standardization needs of wrestling-specific fitness tests (SWFT and SWPT) among 20 freestyle and Greco-Roman wrestlers in Haryana. The following findings emerged across the three main objectives:

◆ Objective 1 – Reliability of SWFT and SWPT

The reliability values of the SWFT and the SWPT were found to be moderate to high specifically when wrestlers have more experiences or competition standard. The results showed that the mean throw count-instances were similar when the test was conducted very time giving the test construct reliability. Overall external variability was reduced through the use of software-timed intervals as well as control of warm-up



protocols. This goes a long way in explaining why the tests simulate the demands of a real match situation as far as anaerobic endurance and power output in a-fatigued State is concerned.

◆ Objective 2 – Performance Comparison

There was a significant difference in the performance level between those wrestlers who achieved successful performance level (Medallist) and those with less successful performance level (Non – medallist). The actual average number of throws in SWFT achieved by these lucrative athletes was 55.38 throws during the three three-seconds segments presented compared to 39.58 throws possessed by the less successful athletes, a difference of 39.9%. They observe that this consistency is apparent in all the segments proving that muscular endurance, recovery capacity, and technicality of the successful group are also higher. The test also separated physical preparation and given purpose for competitiveness in a meaningful manner.

◆ Objective 3 – Standardization & Improvement

The study identified key areas for improvement in test standardization:

- Varying technique execution among less experienced wrestlers reduced score consistency.
- Dummy weight classification based solely on body weight lacked personalization.
- Recommendations included the use of video-assisted scoring, motion sensors, and multiple test trials to increase accuracy and reduce human error.

Discussion revealed that SWFT and SWPT are valuable tools not only for evaluating fitness but also for talent identification, training assessment, and progress monitoring. However, their full potential depends on strict adherence to standardized protocols and continued refinement based on athlete feedback and evolving training methods.

1.8 CONCLUSION

This paper analyzed the practice–test combine reliability, performance, and practical implementation standards of the wrestling-specific fitness tests namely the SWFT and the SWPT across school-level and competitive wrestlers. The study showed that both the tests are useful measures in predicting the wrestling specific physical abilities especially the anaerobic endurance and the muscle power.

The medallist wrestlers performed much better than the others as the throw counts and FAT set was significantly able to classify the various levels of performance of the athletes. These disparities can be attributed not only to the better preparation but also increased skill and training acclimation.



Besides, the study recommended that uniform protocols for warm-up, the use of dummy weight in relative to strength, objective, validation of throw, and testing and assessment should be used. This can be enhanced through introduction of test technology such as video analysis or even the use of motion sensors.

At the end of the study, it has established that SWFT and SWPT can be useful in wrestling programs that are conducted under controlled circumstantial changes. They help in athlete management, identification of talent, and customized training process for improved performance of high performance wrestling athletes.

References

1. American College of Sports Medicine. (2018). *ACSM's guidelines for exercise testing and prescription* (10th ed.). Wolters Kluwer.
2. Bompa, T. O., & Buzzichelli, C. (2019). *Periodization: Theory and methodology of training* (6th ed.). Human Kinetics.
3. Callan, S. D., Brunner, D. M., Devolve, K. L., Mulligan, S. E., Hesson, J., Wilber, R. L., & Kearney, J. T. (2000). Physiological profiles of elite freestyle wrestlers. *Journal of Strength and Conditioning Research*, 14(2), 162–169.
4. Chaouachi, A., Brughelli, M., Levin, G., Boudhina, N. B. B., Cronin, J., & Chamari, K. (2009). Anthropometric and performance comparisons in professional and junior elite handball players. *Journal of Sports Sciences*, 27(2), 163–169. <https://doi.org/10.1080/02640410802448762>
5. Franchini, E., Nakamura, F. Y., Takito, M. Y., Kiss, M. A. P. D. M., & Sterkowicz, S. (1998). Specific fitness test developed in Brazilian judoists. *Biology of Sport*, 15, 165–170.
6. Ghorbanian, B., Mehrli, H., & Ramezaninejad, R. (2010). A study on the relationship of physical fitness and performance in handball. *Journal of Sports Science and Medicine*, 9(1), 53–58.
7. Hübner-Wozniak, E., Kosmol, A., & Lutoslawska, G. (2004). Anaerobic performance of arms and legs in freestyle wrestlers. *Journal of Science and Medicine in Sport*, 7(4), 473–480. [https://doi.org/10.1016/S1440-2440\(04\)80268-6](https://doi.org/10.1016/S1440-2440(04)80268-6)
8. Issurin, V. B. (2008). Block periodization versus traditional training theory: A review. *Journal of Sports Medicine and Physical Fitness*, 48(1), 65–75.



9. Kraemer, W. J., & Fleck, S. J. (2007). *Optimizing strength training: Designing nonlinear periodization workouts*. Human Kinetics.
10. Kumar, R., & Singh, R. (2016). Comparative study of motor fitness among various level handball players. *International Journal of Physical Education, Sports and Health*, 3(3), 149–151.
11. Malina, R. M., Bouchard, C., & Bar-Or, O. (2004). *Growth, maturation, and physical activity* (2nd ed.). Human Kinetics.
12. Marković, M., Tota, M., Bošnjak, J., & Janković, N. (2017). Development of specific wrestling fitness tests. *Journal of Combat Sports and Martial Arts*, 8(2), 97–101.
13. Mohamed, H., Vaeyens, R., Matthys, S., Multael, M., Lefevre, J., Lenoir, M., & Philippaerts, R. (2009). Anthropometric and performance measures for the development of a talent detection model in youth handball. *Journal of Sports Sciences*, 27(3), 257–266. <https://doi.org/10.1080/02640410802482417>
14. Skugor, K., Karnincic, H., Zugaj, N., & Zupetic, M. (2024). Repetition of the Exhaustive Wrestling-Specific Test. *Applied Sciences*, 14(9), 3677. <https://doi.org/10.3390/app14093677>
15. Ziv, G., & Lidor, R. (2009). Physical characteristics, physiological attributes, and on-court performances of handball players: A review. *European Journal of Sport Science*, 9(6), 375–386. <https://doi.org/10.1080/17461390903049995>