

ORIGINAL SCIENTIFIC PAPER

Physical and Performance Differences Between More and Less Experienced Wrestlers

Kreso Skugor¹, Barbara Gilic¹, Ivan Kvesic²

¹University of Split, Faculty of Kinesiology, Split, Croatia, ²University of Mostar, Faculty of Science and Education, Mostar, Bosnia and Herzegovina

Abstract

This study aimed to compare anthropometric characteristics, body composition, and physical performance parameters between more and less experienced wrestlers to determine the influence of competitive experience on key performance indicators. A total of 47 male wrestlers were divided into two groups based on their competitive experience: more experienced (n=22, >6 years) and less experienced (n=25, <6 years). Anthropometric measurements included body mass, height, body mass index (BMI), and body fat percentage (BF%). Performance assessments consisted of the countermovement jump (CMJ), handgrip strength (HGS), and the Specific Wrestling Fitness Test (SWFT). Group differences were analyzed using t-tests for independent samples, and discriminant canonical analysis. More experienced wrestlers had significantly lower body fat percentage (p=0.04) and better performance in the SWFT repetitions test (p=0.001) compared to their less experienced counterparts. They also exhibited a lower heart rate response during the SWFT (p=0.01), indicating better recovery capacity. Also, competing experience was correlated to SWFT repetitions (R=0.51) and SWFT index (R=-0.45). Wrestling experience appears to be associated with wrestling-specific performance. However, the experience did not significantly influence absolute strength or explosive power. These findings suggest that training programs for less experienced wrestlers should emphasize wrestling-specific performance development to improve performance.

Keywords: combat sports, physiological adaptation, training experience, muscular endurance, cardiovascular fitness

Introduction

Wrestling is a highly demanding combat sport that requires a combination of strength, endurance, power, agility, and technical skills to achieve competitive success (Yoon, 2002). Physical and physiological characteristics play a critical role in determining an athlete's performance, with experience level often being a key differentiating factor. Prior research has demonstrated that more experienced wrestlers tend to exhibit superior aerobic and anaerobic conditioning, muscular endurance, and body composition, which are essential for high-level competition (Chaabene et al., 2017; García-Pallarés, López-Gullón, Muriel, Díaz, & Izquierdo, 2011). Body composition and fitness parameters are known to impact performance outcomes in wrestling. A lower body fat percentage (BF%) has been associated with improved strength-to-weight ratio and movement efficiency, contributing to better overall wrestling performance (Kraemer et al., 2001). Indeed, prior research suggests that elite wrestlers consistently maintain lower BF% levels compared to lower-tier competitors, as it allows them to generate greater force relative to their body mass and sustain high-intensity performance throughout matches (Chaabene et al., 2017).

Additionally, sport-specific endurance and muscular strength play a significant role in determining match outcomes, as wrestling requires short bursts of explosive force combined with sustained efforts over multiple rounds (Kraemer et al., 2001; Yoon, 2002). These attributes are commonly assessed through performance tests that measure anaerobic endurance, muscular power, and overall conditioning (Karnincic, Curby, & Cavala, 2015). One such test is the Specific Wrestling Fitness Test (SWFT), which evaluates wrestling-specific endurance and power, simulating real-match conditions by requiring



Correspondence:

Ivan Kvesic

University of Mostar, Faculty of Science and Education, Matice Hrvatske bb, 88000, Mostar, Bosnia and Herzegovina E-mail: kvesic.ivan@gmail.com athletes to perform repeated suplex throws under time constraints (Marković et al., 2021). The ability to execute repeated high-intensity movements efficiently is crucial in wrestling, where prolonged bouts require rapid recovery and sustained power output (García-Pallarés et al., 2011). These tests provide valuable insights into the physiological demands of wrestling and help identify areas where athletes may need further conditioning or strength development. Additionally, SWFT has also been validated in the sample of Croatian wrestlers and exhibited good discriminant validity (Skugor, Gilic, et al., 2023; Skugor, Stajer, Zugaj, Gilic, & Karnincic, 2023).

While previous studies have examined these attributes in elite wrestlers, limited research has focused on how experience level influences these physiological characteristics within a national selection context (García-Pallarés et al., 2011; Skugor, Gilic, et al., 2023). Theoretically, wrestlers with greater competitive experience have undergone years of progressive training, potentially leading to adaptations in strength, endurance, and body composition that distinguish them from less experienced counterparts. Investigating these differences is critical for understanding how competing experience contributes to physiological development and can inform training periodization strategies to optimize athlete performance at various competitive stages. Therefore, this study aimed to examine anthropometric characteristics, body composition, and physical performance parameters in more and less experienced wrestlers, to determine the influence of competitive experience on key performance indicators. Understanding these differences could help optimize training programs and talent identification for wrestling development.

Methods

Participants

This research included 47 Croatian wrestlers aged 16-19 years. Wrestlers were divided into two groups based on their competitive experience: more experienced (n=22, >6 years) and less experienced (n=25, <6 years). At least three years of wrestling experience was prerequisite for study entry. In this manner, researchers hoped to ensure that wrestlers could successfully perform the exams and had the necessary knowledge of wrestling tactics. Having a disease or other health issue that limits a wrestler's ability to do the tests as best they can was the exclusion criterion. Participants signed an informed permission form after being briefed on the testing methods and the investigation's objectives (legal guardians signed an informed consent form for participants under 18 years of age). The study was accepted by the University of Split's Faculty of Kinesiology's Ethical Board (Ref. no. 2181-205-02-05-22-0012).

Variables and testing procedures

The study included anthropometric measurements, generic fitness tests, and sport-specific fitness tests.

Anthropometric measurements consisted of body height, body mass, and body fat percentage, which was estimated using the sum of skinfolds measured on the triceps and calf muscles with a Harpenden skinfold caliper (British Indicators, Burgess Hill, England) and calculated using the Slaughter-Lohman formula.

Generic fitness tests included the countermovement jump (CMJ), and handgrip strength test (HGS). The CMJ was assessed using the Optogate system (Microgate, Bolzano, Italy).

For the CMJ, wrestlers stood in a shoulder-width stance with hands on their hips and performed a maximal vertical jump, preceded by a knee bend and downward movement. Each wrestler completed three trials, with the best jump height used for analysis. The HGS was measured using an electronic hand dynamometer (Camry, Model EH101, Zhongshan Camry Electronic Co. Ltd., China). Wrestlers performed three trials of maximum effort, with the arm adducted and elbow flexed at 90°. The best result (i.e., the highest recorded value) was used for further analysis.

A Specific Wrestling Fitness Test (SWFT) was used to assess sport-specific fitness. This test, recently developed by Markovic, has demonstrated appropriate reliability and validity in wrestlers. The test requires participants to perform maximum-effort suplex throws using a weighted dummy over three 30-second rounds, with 20 seconds of rest between rounds. The dummy weight was adjusted based on weight categories: Wrestlers weighing 55-67 kg used a 23 kg dummy; Wrestlers in the 72-87 kg category used a 25 kg dummy; Wrestlers over 90 kg used a 30 kg dummy. Athletes wore heart rate monitors (POLAR H10, Polar Inc., Lake Success, NY, USA) during the test and throughout the rest period. Heart rate was recorded immediately after the test and one minute post-exercise. The test results included the total number of throws and the SWFT index, calculated as the sum of heart rate values divided by the total number of throws, as proposed by the authors of the test (Marković et al., 2021; Marković, Toskić, Kukić, Zarić, & Dopsaj, 2022).

Statistical analysis

The normality of the variables was checked by the Shapiro-Wilks test. Descriptive statistics included means and standard deviations. The differences in anthropometric characteristics, body composition, and physical performance parameters between more and less experienced wrestlers were checked using independent samples t-test. Additionally, discriminant canonical analysis was used to evidence eventual multivariate differences between groups based on wrestling experience. Pearson's correlation coefficients were used to determine the correlation between competing experience and performance variables. All analysis were performed using program Statistica (TIBCO, Palo Alto, CA), with applying a level of significance of 0.05.

Results

Differences in anthropometric characteristics, body composition, and physical performance parameters between more and less experienced wrestlers are presented in Table 1. More experienced wrestlers had significantly lower body fat percentage (p=0.04) and better performance in the SWFT repetitions test (p=0.001) compared to their less experienced counterparts. They also exhibited a lower heart rate response during the SWFT (p=0.01), indicating better conditioning.

Table 2 displays the findings of the discriminant canonical analysis. It is visible that variables included in the analysis were not significant in a multivariate manner for discriminating wrestlers according to competitive experience.

A moderate positive correlation was found between the number of repetitions completed in the SWFT and the competing experience. Also, the heart rate index in the same test showed a moderate negative correlation with competing experience. The generic performance tests (CMJ and HGS) did not display significant correlations with competing experience (Figure 1).

Variable	More experienced (n=22)		Less experienced (n=25)		T-test	
	Mean	SD	Mean	SD	t-value	р
Age (years)	18.18	1.47	17.28	1.70	1.94	0.06
Competing experience (years)	8.73	2.14	4.44	1.56	7.91	0.001
BM (kg)	74.69	12.63	82.05	15.03	-1.80	0.08
BH (cm)	176.01	7.64	180.04	5.91	-2.04	0.05
BMI	23.95	2.48	25.22	3.83	-1.32	0.19
BF%	13.61	4.27	17.72	7.94	-2.16	0.04
CMJ (cm)	37.16	4.84	34.82	6.82	1.26	0.21
HGS (kg)	48.37	8.42	49.75	7.25	-0.58	0.57
SWFT REPS	27.95	3.79	24.67	3.00	3.24	0.001
SWFT index HR	12.45	2.04	14.13	1.96	-2.81	0.01

Table 1. Descriptive statistics and differences in anthropometric characteristics, body composition, and physical performance parameters between more and less experienced wrestlers

Note. BM – body mass, BH – body height, BMI – body mass index, BF% body fat percentage, CMJ – countermovement jump, HGS – handgrip strength, SWFT – specific wrestling fitness test, HR – heart rate, REPS – repetitions

Table 2. Discriminant canonical function analysis for differencesbetween more and less experienced wrestlers in all variables.

	Root
Body mass	-0.50
Body height	-0.51
Body fat percentage	-0.56
Countermovement jump	0.37
Handgrip strength	-0.17
SWFT total throws	0.87
Eigenvalue	0.28
Canonical R	0.46
Wilk's lambda	0.78
Chi-square	9.36
p-value	0.15
Centroid: More experienced	0.58
Centroid: Less experienced	-0.46

Note. SWFT – specific wrestling fitness test



FIGURE 1. Correlation graphs and correlation coefficients (R) between A) Countermovement jump; B) Hand grip strength; C) Specific wrestling fitness test repetitions; D) Specific wrestling fitness test heart rate index and competing experience. CMJ – countermovement jump, HGS – handgrip strength, SWFT – specific wrestling fitness test, HR – heart rate, REPS - repetitions

Discussion

This study investigated the influence of competing experience on anthropometric characteristics, body composition, and physical performance parameters in wrestlers. There are several most significant results: (i) more experienced wrestlers had better sport-specific performance results than less experienced ones, but they did not differ in the generic performance variables; (ii) competing experience was significantly correlated to sport-specific performance variables, while it was not correlated with generic performance variables.

Differences in anthropometric characteristics, body composition, and physical performance parameters between more and less experienced wrestlers

Generally, the findings of this study indicate that more experienced wrestlers demonstrate a lower body fat percentage, and superior sport-specific endurance, as reflected by their higher performance in the SWFT repetitions test and lower heart rate response during SWFT. These results align with previous research suggesting that longer training exposure and high-intensity competition contribute to improved cardiovascular efficiency and muscular endurance in combat athletes (Franchini, Del Vecchio, Matsushigue, & Artioli, 2011; Tortu, Birol, & Aksarı, 2023). The ability to execute repeated high-intensity movements efficiently is crucial in wrestling, where prolonged bouts require rapid recovery and sustained power output (García-Pallarés et al., 2011).

Raw explosive power and grip strength may not be exclusively influenced by years of training or competition experience, as seen by the lack of discernible differences in CMJ and HGS between wrestlers with and without more experience. Rather, these characteristics might be more impacted by training specificity, genetic predisposition, or tactical adjustments made over time. This is consistent with earlier studies on professional judo athletes, which showed that movement patterns, technical efficiency, and tactical execution frequently outperform absolute strength as the main factors influencing success (Franchini et al., 2011). Despite their contributions to particular facets of wrestling, such as takedowns and grip control, CMJ and HGS don't seem to be reliable indicators of competitive success. This supports the idea that wrestling performance is a complex process that calls for a combination of technical proficiency, stamina, and strategic application rather than merely discrete physical prowess (Chaabene et al., 2017).

On the other hand, experienced wrestlers' notable better results in SWFT performance highlight how important muscular and sport-specific endurance are in competition. Athletes must sustain their strength and power output while maintaining technical execution under fatigue during wrestling matches, which require frequent high-intensity bursts of activity (Yoon, 2002). Experienced wrestlers' better SWFT results imply that extended exposure to competitive settings improves muscular endurance and cardiovascular efficiency, enabling them to recuperate more effectively in between intense exchanges (Miarka et al., 2020). These results emphasize the necessity of focused conditioning regimens to close the endurance capacity disparity, especially for wrestlers with less experience. To maximise performance outcomes and recovery capabilities, training regimes should prioritize interval-based endurance drills, conditioning exercises unique to wrestling (García-Pallarés et al., 2011).

Correlation between competing experience and performance variables

As evidenced by the moderately positive connection between competing experience and the number of repetitions performed in the SWFT, the correlation analysis's findings imply that sport-specific endurance and efficiency are critical to wrestling performance. According to Franchini et al. (2011), this result is consistent with earlier studies emphasizing the value of muscle endurance and repeated high-intensity efforts in combat sports. One of the most important factors in determining wrestling performance is the capacity to perform technical maneuvers under exhaustion, maintain grip strength, and sustain repeated explosive motions. Furthermore, the hypothesis that seasoned wrestlers may have better cardiovascular efficiency, enabling them to maintain high performance with less physiological stress, is further supported by the observed negative connection between heart rate index and competitive experience in SWFT (Marković et al., 2022). Precisely, a lower HR index displays better recovery capacity of the athlete (Marković et al., 2022). Similar trends have been reported in other combat sports, where elite athletes demonstrate lower heart rate responses due to better technical execution and improved energy system utilization (Andreato, Lara, Andrade, & Branco, 2017; Bridge, Ferreira da Silva Santos, Chaabène, Pieter, & Franchini, 2014).

Conversely, CMJ and HGS showed almost no correlation with competing experience, suggesting that generic physical fitness may not directly translate to competitive success in wrestling. While explosive lower-body power and grip strength are undoubtedly important for certain wrestling manoeuvres, their independent contribution to the overall competition experience appears limited (James, Haff, Kelly, & Beckman, 2016). Rather, wrestling performance might depend more on the capacity to combine various technical, tactical, and physical elements in situations unique to the sport (Chaabene et al., 2017). This research supports the idea that, given the dynamic and high-intensity character of wrestling, success depends more on the ability to employ strength and power effectively than it does on having the most of each of these qualities. Future studies should look more closely at how training regimens can improve efficiency and endurance unique to a certain sport that is necessary for peak competitive performance.

Conclusions

This study highlights the key physical and performance differences between more and less experienced wrestlers, emphasizing the role of training experience in conditioning, body composition, and muscular endurance. More experienced wrestlers exhibited lower body fat percentage, better sport-specific endurance, and superior cardiovascular efficiency, as evidenced by their higher SWFT performance and lower post-test heart rate response. However, no significant differences were found in handgrip strength or jumping performance, suggesting that absolute strength and explosive power may not be solely experienced-dependent. Moreover, there was no significant correlation between competing experience and generic fitness performance. At the same time, there was a moderate correlation with wrestling-specific performance variables, which further proves that competing experience influences more sport-specific variables compared to generic fitness variables.

These findings have important implications for wrestling training and athlete development, particularly for less experienced wrestlers, who may benefit from targeted endurance training, sport-specific conditioning, and body composition

Acknowledgments

Authors are grateful to coaches and athletes who voluntarily participated in this research.

Conflict of interest

Authors declare no conflicts of interest.

Received: 23 February 2025 | Accepted: 29 March 2025 | Published: 01 June 2025

References

- Andreato, L. V., Lara, F. J. D., Andrade, A., & Branco, B. H. M. (2017). Physical and Physiological Profiles of Brazilian Jiu-Jitsu Athletes: a Systematic Review. Sports Medicine Open, 3(1), 9. doi:10.1186/s40798-016-0069-5
- Bridge, C. A., Ferreira da Silva Santos, J., Chaabène, H., Pieter, W., & Franchini, E. (2014). Physical and physiological profiles of taekwondo athletes. *Sports Medicine*, 44(6), 713-733. doi:10.1007/s40279-014-0159-9
- Chaabene, H., Negra, Y., Bouguezzi, R., Mkaouer, B., Franchini, E., Julio, U., & Hachana, Y. (2017). Physical and Physiological Attributes of Wrestlers: An Update. *Journal of Strength and Conditioning Research*, *31*(5), 1411-1442. doi:10.1519/jsc.000000000001738
- Franchini, E., Del Vecchio, F. B., Matsushigue, K. A., & Artioli, G. G. (2011). Physiological profiles of elite judo athletes. *Sports Medicine*, 41(2), 147-166. doi:10.2165/11538580-00000000-00000
- García-Pallarés, J., López-Gullón, J. M., Muriel, X., Díaz, A., & Izquierdo, M. (2011). Physical fitness factors to predict male Olympic wrestling performance. *European Journal of Applied Physiology*, 111(8), 1747-1758. doi:10.1007/s00421-010-1809-8
- James, L. P., Haff, G. G., Kelly, V. G., & Beckman, E. M. (2016). Towards a Determination of the Physiological Characteristics Distinguishing Successful Mixed Martial Arts Athletes: A Systematic Review of Combat Sport Literature. Sports Medicine, 46(10), 1525-1551. doi:10.1007/

management to improve their competitive readiness. Future research should explore longitudinal training adaptations and the impact of specific training interventions on performance progression in combat sports.

s40279-016-0493-1

- Karnincic, H., Curby, D., & Cavala, M. (2015). Factors of success in advanced level wrestling; reliability and validity of several diagnostic methods. JCSMA, 6(2), 77-83.
- Kraemer, W. J., Fry, A. C., Rubin, M. R., Triplett-McBride, T., Gordon, S. E., Koziris, L. P., . . . Fleck, S. J. (2001). Physiological and performance responses to tournament wrestling. *Medicine in Science of Sports and Exercise*, 33(8), 1367-1378. doi:10.1097/00005768-200108000-00019
- Marković, M., Kukić, F., Dopsaj, M., Kasum, G., Toskic, L., & Zaric, I. (2021). Validity of a Novel Specific Wrestling Fitness Test. *Journal of Strength* and Conditioning Research, 35(Suppl 2), S51-s57. doi:10.1519/ jsc.000000000003538
- Marković, M., Toskić, L., Kukić, F., Zarić, I., & Dopsaj, M. (2022). Sensitivity of Field Tests for Assessment of Wrestlers Specific Fitness. *Journal of Human Kinetics*, 83, 267-276. doi:10.2478/hukin-2022-0069
- Miarka, B., Soto, D. A. S., Aedo-Muñoz, E., Fernandes, J. R., Brabec, L., & Brito, C. J. (2020). Effects of Competitive Wrestling Bouts on Physiological Measures: A Systematic Review and Meta-analysis. Sports Orthopaedics and Traumatology, 36(1), 34-51.
- Skugor, K., Gilic, B., Karninčić, H., Jokai, M., Babszky, G., Ranisavljev, M., ... Drid, P. (2023). What Determines the Competitive Success of Young Croatian Wrestlers: Anthropometric Indices, Generic or Specific Fitness Performance? *Journal of Functional Morphology and Kinesiology*, 8(3). doi:10.3390/jfmk8030090
- Skugor, K., Stajer, V., Zugaj, N., Gilic, B., & Karnincic, H. (2023). Generic and specific fitness profile of elite youth Greco-Roman wrestlers; Differences According to Quality and Weight Category. Sport Mont, 21(1), 23-30.
- Tortu, E., Birol, A., & Aksarı, M. (2023). Evaluation of Different Equations for Resting Metabolic Rate Prediction in Female Combat Sports Athletes. *Montenegrin Journal of Sports Science & Medicine*, 12(2).
- Yoon, J. (2002). Physiological profiles of elite senior wrestlers. Sports Medicine, 32(4), 225-233. doi:10.2165/00007256-200232040-00002