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THE INFLUENCE OF A WRESTLER'S PREPARATION ON SUCCESS AND MORPHOLOGICAL COMPOSITION

Milan Marković[1], Milivoj Dopsaj[2], Mehmet Ismail Tosun[3]

In wrestling, in addition to technical and tactical training, success largely depends on physical prepardness. The subject of this paper is morphological composition and success in specific wrestling tests. The aim of the paper is to examine the direct influence of the level of prepardness on success and the indirect influence on morphological composition in wrestlers. Success is defined by the total number of throws in both the shorter Specific Wrestling Fitness Test (SWFT) and the longer and more physically demanding Specific Wrestling Performance Test (SWPT). Morphological composition is defined by the percentage values of body fat (PBFM) and muscle mass (PSMM). The sample consists of 26 wrestlers, divided into two groups, in 4 different ways, from the aspect of prepardness. In this regard, preparedness was defined by the movement of lactate values from the 3rd to the 5th minute, in subjects whose lactates increased (La3-5min.↑) and decreased (La3-5min.↓), by the percentage of pulse rate recovery to the 1st (ΔHR1min ≤9.99% and ≥5.99%) and 5th (ΔHR5min ≤39.99% and ≥40%) minute, and the number of throws in the tests (≤25 and ≥26 on the SWFT; ≤34 and ≥35 on the SWPT). The applied t test determined the absence of a statistically significant difference between the defined groups of lactate value movements as a function of the number of throws on both the SWFT ($p = 0.867$) and the SWPT ($p = 0.131$). It was also found that there were no statistically significant differences in PBFM ($p = 0.769$) and PSMM ($p = 0.601$) on the SWFT, while the longer SWPT, with its demands, showed a significant difference in PBFM ($p = 0.031$) and PSMM ($p = 0.018$) in favor of the faster metabolic recovery. Further analysis of the difference revealed no statistically significant difference between the groups with different levels of pulse rate recovery both up to the 1st and 5th minute, regardless of the variables and the test ($p = 0.067 – 0.918$). The defined groups of success on the tests as a function of the level of preparedness are statistically significantly different by the nature of the data distribution regardless of the test ($p = 0.000$), while from the morphological aspect they also showed significant differences in the PBFM both on the SWFT ($p = 0.001$) and on the SWPT ($p = 0.000$), and in the PSMM but only on the more demanding test (SWPT, $p = 0.044$).

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Different types of preparation characterize different sports, but it is often very difficult to define a sport as exclusively aerobic or anaerobic, rather these energy requirements are intertwined, which is supported by the different distribution of wrestlers, in defined groups of type and level of preparation, at different loads. In this regard, in this way, we have determined that the preparedness of a wrestler cannot be viewed only from the aspect of metabolic or cardiovascular components, but as an interweaving of all energy components, and success on tests itself as the most discriminating parameter of preparedness, which entails the best ratio of morphological structure.

Keywords: combat sports, field testing, performance, lactate concentration, heart rate

Introduction

In order to achieve elite sporting performance, it is necessary to ensure an adequate level of athletes' preparedness, which may include physical, technical, tactical, psychological, and theoretical preparation. The importance of different forms of preparedness varies depending on the characteristics of the sport, while in combat sports, physical preparation is given particular emphasis (Mirzaei & Akbarnezhad, 2008).

In combat sports such as wrestling, boxing, judo, and karate, in which weight categories are strictly defined by the rules, morphological characteristics, i.e., body composition, represent one of the key determinants of sporting success (Dopsaj et al., 2013). Of particular importance in this context is the relationship between muscle and fat components of body composition, which directly affects the expression of specific motor and energy-related performances in wrestling. A greater proportion of muscle mass enables more efficient development of maximal and explosive strength, as well as a higher capacity for repeated execution of high-intensity activities during a bout, whereas an increased amount of adipose tissue represents functionally inactive mass that may negatively affect movement speed, agility, and work economy (Mirzaei & Akbarnezhad, 2008; Kim et al., 2011). In addition, an unfavorable muscle-to-fat ratio may lead to faster fatigue and delayed recovery, which is particularly evident under conditions of multiple matches during competitions (Horswill, 2012; Reale et al., 2017).

Another central issue in wrestling training and competitive practice is body mass control. In practice, rapid weight-loss methods are often applied, which may impair athletes' health and reduce their functional and competitive capacities, ultimately negatively affecting performance outcomes (Ćirković et al., 2011).

The somatotype of elite wrestlers is characterized by dominant mesomorphic traits, reflected in pronounced muscularity and a low percentage of body fat. It is generally

considered that the optimal level of body fat in wrestlers ranges between 7% and 10%, achieved through a properly balanced combination of training and nutrition, with exceptions most commonly observed in wrestlers competing in the highest weight categories (Kasum & Dopsaj, 2012).

The subject of this study is body composition and performance in specific wrestling tests (Specific Wrestling Fitness Test - SWFT and Specific Wrestling Performance Test - SWPT). The aim of the study was to examine the direct effect of the level of preparedness on performance, as well as its indirect effect on body composition, in wrestlers.

Methods

Sample

The sample consisted of 26 wrestlers, aged 20.2 ± 1.7 years, with a training experience of 6.7 ± 3.2 years, 7.8 ± 1.9 training sessions per week, body height of 178.9 ± 5.6 cm, body mass of 82.9 ± 7.4 kg, and body mass index of 25.9 ± 2.0 kg/m². In accordance with the aim of the study, the participants were divided into two groups in four different ways (Table 1). All participants were informed about the testing procedures. They participated voluntarily in the study and provided written informed consent. The study was conducted in accordance with the Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects (World Medical Association, 2013), and was approved by the Ethics Committee of the Faculty of Sport and Physical Education, University of Belgrade (No. 02-484-2).

Table 1. - Structure of the distribution of respondents according to defined groups

Tipe	Groups	N	
		SWFT	SWPT
LA 3-5min	La increse ↑	17	10
	La decrese ↓	9	16
ΔHR1min	HR recovery ≤9.99%	15	21
	HR recovery ≥10%	11	5
ΔHR5min	HR recovery ≤39.99%	13	14
	HR recovery ≥40%	13	12
Total number of throws	≤25 throws	14	13
	≥26 throws	12	13

Testing procedure

The data collection process was conducted using previously standardized measurement procedures, both with respect to the analysis of morphological body struc-

ture (Gibson et al., 2008; Sillanpää et al., 2014) and field-based tests (Marković et al., 2017; Marković et al., 2018; Marković et al., 2021; Marković et al., 2022). Body composition measurements were performed using the InBody 270 analyzer during the morning hours. Participants were instructed not to consume food prior to testing; after the measurement, they were provided with a meal and allowed a minimum of two hours before further testing. Subsequently, all participants underwent a final theoretical and practical familiarization with the testing procedures. Prior to testing, a general warm-up lasting 10 minutes was performed, followed by an additional 5 minutes of specific warm-up consisting of partner throws or throws with a wrestling dummy, after which a 5-minute rest period was provided. During testing, participants used a wrestling dummy (Suples, Ltd., ID, USA) and performed the "front suplex" technique. The order of test administration was randomized. Participants with body mass below 74.99 kg used a 22 kg dummy; those with body mass between 75.00 and 89.99 kg used a 27 kg dummy; and participants weighing over 90.00 kg used a 32 kg dummy (Marković et al., 2017). In this way, the relative load of the dummy was standardized according to the athletes' weight categories.

Before testing, a Polar H7 heart rate sensor (Polar, Inc., Lake Success, NY, USA) was placed around the participants' chest to continuously record heart rate. At the end of each test, the wrestlers performed one minute of active recovery, followed by a seated position to enable the assessment of blood lactate concentration, while heart rate monitoring continued according to a standardized protocol. Heart rate was sampled immediately after completion of the test, as well as during the first and fifth minute of recovery (HR1min and HR5min), and expressed in beats per minute (bpm). Lactate concentration was sampled during the third (La3min) and fifth (La5min) minute of recovery and expressed in $mmol \cdot L^{-1}$. Blood lactate concentration was analyzed using a new-generation portable lactate analyzer (Lactate Plus, Nova Biomedical, USA), based on lactate oxidation (lactate oxidase biosensor methodology) (Kulandaivelan et al., 2009; Hart et al., 2013). All samples were obtained from capillary blood collected from the fingertip by an experienced medical technician (Dopsaj & Janković, 2014), with a different finger used for each sampling. For the invasive part of the testing, a single-use lancet (Unistik 3 Comfort, Owen Mumford Ltd., UK) was applied. A 30-minute period of combined rest was provided between the tests.

Both tests were time-controlled using dedicated software programmed in accordance with the temporal structure of the tasks in both tests (standardized throwing intensity, maximal throwing intensity, and recovery). The software provided visual time display, segment identification, and auditory signals indicating test preparation, start, and completion.

Specific Wrestling Fitness Test (SWFT)

The test consisted of three 30-second throwing bouts, separated by 20-second rest intervals. Upon the signal to start the test, participants performed wrestling dummy throws at maximal intensity, aiming to complete as many throws as possible within the given time (Marković et al., 2017; Marković et al., 2018a). The primary task was to achieve the highest possible number of throws across all three segments; therefore, the total number of throws completed during the entire test (TnT) was used as the main outcome measure, representing the final state of specific work capacity.

Specific Wrestling Performance Test (SWPT)

The test consisted of two 3-minute rounds designed to simulate the duration of wrestling bouts. The rounds were separated by a 30-second rest interval. Briefly, during the first 30 seconds, participants performed one dummy throw every 10 seconds. This was followed by a 20-second period during which the maximal number of throws was performed, after which a 10-second passive rest ensued. The same sequence was repeated during the second minute. In the third minute, instead of a 20-second maximal-effort phase, participants performed the maximal number of throws for 30 seconds. This was followed by 30 seconds of passive rest. The second 3-minute round was identical to the first. The total number of throws performed during the maximal-effort phases across the entire test (i.e., both rounds) was taken as the final test score (Marković et al., 2017; Marković et al., 2018; Marković et al., 2021; Marković et al., 2022).

Variables

In line with the aim of the study, the morphological variables observed included percentage of body fat mass (PBFM, %) and percentage of skeletal muscle mass (PSMM, %) (InBody 720). From the perspective of preparedness, the primary performance variable was the total number of throws (TnT) achieved in the tests. Additional parameters, such as blood lactate concentrations in the 3rd and 5th minute of recovery and heart rate values immediately after the tests and during the 1st and 5th minute of recovery, were used for defining the observed groups.

Statistical Analysis

All statistical analyses were performed using the Statistical Package for the Social Sciences (IBM SPSS Statistics 20.0). Results are presented as means (Mean), standard deviations (SD), and standard errors (SE). Student's t-test was used to determine differences between groups. The level of statistical significance was set at $p < 0.05$ (Hair et al., 1998).

Results

Table 2 presents the descriptive statistics and t-test results for the variables PBFM, PSMM, and TnT as a function of the defined groups based on different aspects of preparedness, as assessed by the Specific Wrestling Fitness Test. Preparedness examined through changes in lactate values from the 3rd to the 5th minute of recovery, or through the percentage of heart rate recovery at the 1st and 5th minute, did not demonstrate statistically significant differences between the defined groups for any of the analyzed variables (p = 0.067–0.918). In contrast, the total number of throws achieved during the test, as the simplest indicator of preparedness, showed statistically significant differences in relation to PBFM (p = 0.001) and, as expected, TnT itself (p = 0.000), whereas differences in the percentage of skeletal muscle mass were not statistically significant (p = 0.081).

Table 2. - Descriptive and Difference Results of Specific Wrestling Fitness Test Scores

Tipe	Variables	Groups	Descriptive statistics			t-test for Equality of Means		
			Mean	Std. Deviation	Std. Error	t	Sig.	Mean Difference
LA 3-5min	PBFM	La↑	13.58	3.87	0.94	-0.298	0.769	-0.540
		La↓	14.12	5.30	1.77			
	PSMM	La↑	49.18	2.29	0.56	0.530	0.601	0.553
		La↓	48.63	2.95	0.98			
	TnT	La↑	24.88	5.02	1.22	-0.169	0.867	-0.340
		La↓	25.22	4.58	1.53			
ΔHR1min	PBFM	≤9.99%	13.85	3.71	0.96	0.105	0.918	0.183
		≥10%	13.66	5.23	1.58			
	PSMM	≤9.99%	48.67	2.00	0.52	-0.746	0.463	-0.746
		≥10%	49.42	3.10	0.94			
	TnT	≤9.99%	26.47	4.39	1.13	1.922	0.067	3.467
		≥10%	23.00	4.75	1.43			
ΔHR5min	PBFM	≤39.99%	14.23	2.89	0.80	0.537	0.596	0.923
		≥40%	13.31	5.48	1.52			
	PSMM	≤39.99%	48.61	1.65	0.46	-0.769	0.450	-0.759
		≥40%	49.37	3.15	0.87			
	TnT	≤39.99%	25.46	5.08	1.41	0.484	0.632	0.923
		≥40%	24.54	4.63	1.28			
Total number of throws	PBFM	≤25	16.24	3.80	1.01	3.983	0.001	5.360
		≥26	10.88	2.91	0.84			
	PSMM	≤25	48.20	2.33	0.62	-1.820	0.081	-1.710
		≥26	49.91	2.45	0.71			
	TnT	≤25	21.00	1.62	0.43	-11.593	0.000	-8.667
		≥26	29.67	2.19	0.63			

Table 3 presents the descriptive statistics and *t*-test results for the previously mentioned variables obtained in the Specific Wrestling Performance Test. Statistically significant differences were identified between the defined groups with different levels of preparedness from the perspective of metabolic recovery (La 3–5 min) for the variables PBFM (p = 0.031) and PSMM (p = 0.018), whereas no significant differences were observed for TnT (p > 0.05). The analysis of the monitored variables from the perspective of preparedness as a function of the rate of cardiovascular recovery (ΔHR1min and ΔHR5min) did not reveal statistically significant differences between the groups defined according to the percentage decrease in heart rate (p > 0.05). When the examined variables were analyzed from the basic aspect of preparedness, i.e., the number of throws performed in the test, highly statistically significant differences were found in relation to PBFM (p = 0.000), PSMM (p = 0.044), and TnT (p = 0.000).

Table 3. - Descriptive and difference results of the results achieved on the Specific Wrestling Performance Test

Tipe	Variables	Groups	Descriptive statistics			t-test for Equality of Means		
			Mean	Std. Deviation	Std. Error	t	Sig.	Mean Difference
LA 3-5min	PBFM	La↑	16.04	4.35	1.37	2.293	0.031	3.690
		La↓	12.35	3.76	0.94			
	PSMM	La↑	47.56	2.12	0.67	-2.545	0.018	-2.319
		La↓	49.88	2.34	0.59			
	TnT	La↑	32.60	7.55	2.39	-1.565	0.131	-4.713
		La↓	37.31	7.43	1.86			
ΔHR1min	PBFM	≤9.99%	14.06	3.79	0.83	0.701	0.490	1.522
		≥10%	12.54	6.51	2.91			
	PSMM	≤9.99%	48.88	2.21	0.48	-0.432	0.670	-0.545
		≥10%	49.43	3.76	1.68			
	TnT	≤9.99%	34.48	7.31	1.60	-1.420	0.168	-5.324
		≥10%	39.80	8.56	3.83			
ΔHR5min	PBFM	≤39.99%	14.41	2.76	0.74	0.817	0.422	1.398
		≥40%	13.02	5.68	1.64			
	PSMM	≤39.99%	48.80	1.58	0.42	-0.398	0.694	-0.397
		≥40%	49.20	3.33	0.96			
	TnT	≤39.99%	33.57	6.89	1.84	-1.409	0.172	-4.179
		≥40%	37.75	8.24	2.38			
Total number of throws	PBFM	≤34	16.58	3.73	1.03	4.338	0.000	5.615
		≥35	10.96	2.80	0.78			
	PSMM	≤34	48.01	2.32	0.64	-2.130	0.044	-1.951
		≥35	49.96	2.36	0.65			
	TnT	≤34	28.54	2.93	0.81	-11.820	0.000	-13.923
		≥35	42.46	3.07	0.85			

Discusions

The aim of this study was to examine the influence of wrestlers' preparedness on sporting performance and morphological characteristics, with preparedness conceptualized through several interrelated aspects: the dynamics of lactate concentration during recovery, the percentage of heart rate recovery during the first and fifth minute post-exercise, and the effectiveness of performing specific wrestling tasks expressed as the number of throws. The obtained results indicate that the relationship between muscle and fat components of body composition exerts a differentiated influence on these aspects of preparedness and performance, with the most pronounced effects observed in the domains of achieved performance and metabolic response.

The analysis of lactate concentration during the 3rd to 5th minute of recovery showed that participants with a less favorable morphological profile-i.e., a higher percentage of body fat and a lower proportion of skeletal muscle mass-exhibited higher lactate values, particularly during the Specific Wrestling Performance Test. These findings suggest a greater reliance on anaerobic energy pathways and a reduced capacity for the clearance of metabolic by-products in athletes with less favorable body composition, which is consistent with previous research in combat sports (Horswill, 2012; Mirzaei & Akbarnezhad, 2008). A higher proportion of functionally active muscle mass facilitates more efficient energy resynthesis and faster lactate oxidation, thereby reducing metabolic load during and after high-intensity exercise.

The results related to heart rate recovery during the first and fifth minute after exertion indicate that these indices are not always clearly differentiated with respect to morphological characteristics. Although no statistically significant differences were observed in most of the analyzed variables, a consistent trend toward more favorable recovery was noted in athletes with a lower percentage of body fat. These findings suggest that heart rate recovery is multifactorially determined and, in addition to body composition, depends on aerobic capacity, autonomic regulation, and the overall training status of wrestlers, which is in line with reports in the literature (Sundgot-Borgen & Garthe, 2011).

The clearest and most consistent findings were obtained in the analysis of performance in specific wrestling tasks expressed by the number of throws performed. Results from both tests demonstrated that athletes with a more favorable muscle-to-fat ratio achieved a significantly higher number of throws, directly indicating greater efficiency in the execution of technical and tactical activities. This finding confirms that the muscular component of body mass represents a key basis for force production, explosiveness, and repeated technical efficiency, whereas an increased

percentage of adipose tissue acts as a limiting factor for performance (Kim et al., 2011; Reale et al., 2017).

Overall, the results indicate that wrestlers' preparedness is strongly associated with morphological characteristics, although this relationship is not equally expressed across all analyzed aspects. While metabolic response and final performance outcomes are clearly differentiated with respect to body composition, cardiovascular recovery parameters appear to be less sensitive to morphological differences. These findings have important practical implications for the training process, as they suggest that optimizing body composition primarily affects performance effectiveness in specific wrestling activities, whereas improving recovery requires an integrated approach encompassing both conditioning and functional training components.

The obtained results are consistent with contemporary concepts of long-term body composition management in combat sports, which emphasize the need to avoid rapid and extreme weight-loss methods due to their negative effects on health and performance (Ćirković et al., 2011; Reale et al., 2017). Accordingly, it can be concluded that properly planned preparedness, based on an optimal balance between muscle and fat components, represents a key prerequisite for achieving a high level of sporting success in wrestling.

Conclusion

Based on the obtained results, it can be concluded that wrestlers' preparedness has a significant influence on sporting performance and morphological characteristics, with the strongest effects observed in the domains of achieved performance and metabolic response to specific loads. Preparedness, assessed through the dynamics of lactate concentration, the percentage of heart rate recovery during the first and fifth minute post-exercise, and the effectiveness of executing specific wrestling tasks expressed by the number of throws, proved to be a complex and multidimensional indicator of sporting performance.

The study results indicate that wrestlers with a more favorable morphological profile-characterized by a lower percentage of body fat and a higher proportion of skeletal muscle mass-achieve superior performance, expressed through a greater number of throws and lower lactate concentrations during the recovery period. These findings confirm that an optimal balance between muscle and fat components represents one of the key determinants of success in wrestling, as it enables more efficient force production, improved tolerance to high-intensity loads, and a more favorable metabolic response.

Heart rate recovery parameters during the first and fifth minute after exertion showed a weaker association with morphological characteristics, suggesting that recovery processes are also influenced by other factors, such as aerobic capacity, training status, and individual physiological adaptations. Nevertheless, a trend toward more favorable recovery was observed in athletes with better body composition, further highlighting the importance of systematic and planned management of morphological characteristics within the training process.

Taken together, the results of this study confirm that success in wrestling is largely conditioned by the interrelationship between athletes' morphological composition and preparedness. However, wrestlers' preparedness should not be viewed solely from a metabolic or cardiovascular perspective, but rather as an integration of all energy system components, with performance outcomes in specific tests representing the most discriminative indicator of preparedness. These findings have important practical implications, emphasizing the need for long-term monitoring and optimization of body composition through appropriately structured training and nutrition, while avoiding abrupt and inadequate weight-reduction methods. Such an approach may lead to improved performance, enhanced recovery quality, and overall competitive success in wrestling.

Conflict of interests:

The authors declare no conflict of interest.

Author Contributions:

Resources, M.M. and M.D.; Methodology, M.M. and M.I.T.; Investigation, M.M. and M.D.; Data curation, M.M. and M.I.T.; Formal Analysis, M.D. and M.I.T.; Writing – original draft, M.M. and M.D.; Writing – review & editing, M.M., M.D. and M.I.T.;

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EFFECTS OF A TRAINING PROGRAM ON STRENGTH DEVELOPMENT IN SENIOR TABLE TENNIS PLAYERS

Đorđe Pavlović[1], Stefan Đorđević[2]

Abstract: This systematic review examines the effectiveness of various training programs on the development of strength in senior-category table tennis players. Eight studies were included, all analyzing the effects of strength-related training interventions. A total of 279 participants were covered, with an average age of 21.67 ± 2.41 years, while the duration of the programs ranged from 4 to 12 weeks. Among the included studies, seven reported positive outcomes, whereas one study found no noticeable effects. The synthesis of findings indicates that training programs based on plyometric, combined, ballistic, or functional approaches lead to significant improvements in muscle strength parameters. Programs lasting six to eight weeks, performed three times per week, proved to be the most effective for enhancing different components of strength.

Keywords: table tennis, motorical abilities, strength, senior

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Introduction

Table tennis is a complex sport characterized by dynamic gameplay, rapid and precise movements, superior reflex capabilities, and demands for sustained concentration (Zhu, Suo, & Liu, 2024). This very dynamism and the demanding nature of the sport justify the consideration of table tennis as a discipline with highly diverse motor requirements. Due to the wide range of motor skills applied during play, table tennis is classified among polystructural complex sports, in which open and semi-open movement patterns predominate under variable playing conditions (Đukić, 2020).

Modern table tennis represents the pinnacle of technical-tactical, physical, and psychological preparation. This is evidenced by matches that are increasingly longer in duration, accompanied by a consistent rise in game intensity. Since all elite table tennis players exhibit the highest level of technical proficiency, athletes at this level increasingly emphasize physical preparation to gain an advantage over opponents during matches (Ormai, Sabo, & Bjelica, 1981).

During demanding and prolonged seasons, particularly in extended tournaments, optimal physical preparation is a key determinant of success in table tennis. A high level of physical conditioning encompasses well-developed motor and functional abilities. In contemporary training processes across sports disciplines, mastering and rehearsing technical-tactical elements requires an appropriate level of physical readiness. In the development of physical abilities, particular attention must be given to capacities that are of critical importance to the sport. Achieving elite performance in table tennis necessitates that the training process be grounded in evidence from scientific research (Đukić, 2016).

Muscular strength plays a decisive role in determining the speed and power of athletic performance. Although individual performance is primarily influenced by sport-specific skills, higher levels of strength provide greater potential for athletic achievement, especially among untrained individuals (Chanavirut et al., 2017).

Strength training is widely applied in sports and has been shown to enhance athletes' explosive power, overall strength performance, and body control. However, in table tennis, the higher the athlete's level, the more difficult it becomes to detect subtle changes resulting from training. Integrating resistance training with plyometric exercises appears to be an effective method for improving these aspects of physical readiness in both the upper and lower body of table tennis players. Numerous strength and conditioning specialists incorporate these training modalities into programs to enhance physical performance. Nonetheless, resistance and plyometric

training differ in their approaches to developing strength, muscular power, and hypertrophy. Resistance training focuses on slow and controlled movements, whereas plyometric training involves explosive and ballistic movements that efficiently enhance strength performance (Zhu et al., 2024).

In addition to these methods, other forms of strength, such as strength endurance and speed-strength, can be developed through specialized conditioning programs that include functional exercises, interval sessions, and sport-specific drills. Combining these approaches enables athletes to perform powerful muscular contractions, respond effectively during rallies, and maintain a high level of performance throughout the match (Zhu et al., 2024).

Subject, aims and objectives of the study

The subject of this research is the physical preparedness of table tennis players, with a particular focus on the development of muscular strength and its effects on technical-tactical and motor performance in modern table tennis.

The aim of this study is to determine the effects of different training programs on the development of strength in senior category table tennis players.

In accordance with the defined subject of the study and to achieve the stated aim, the following objectives will be pursued:

1. To collect and systematize relevant literature on the effects of different training programs on the development of strength in senior category table tennis players.
2. To analyze and systematize the collected research.
3. To examine the impact of various training programs on the development of strength in senior category table tennis players.
4. To present the results in a tabular format, providing an overview of key findings from the selected studies.
5. To provide recommendations for practical application and future research.

Methods

In the preparation of this study, which represents a systematic review, the methods of descriptive analysis, systematization, and critical analysis will be applied. The method of this study is descriptive, and the writing is based on available literature.

The literature was collected through internet searches as well as from accessible works in the following databases: Google Scholar, SCIndex, and KoBson. The search focused on studies published in the period from 2000 to 2025. The identified studies (abstracts and full texts) were read and analyzed. To be included in the final analysis, studies had to meet three criteria: they must be experimental in nature, involve training programs aimed at strength development, and have male senior table tennis players as participants. The keywords used in the database searches were: *table tennis, motorical abilities, senior, strength, effect program exercise*. Only studies that were complete and met the inclusion criteria, with fully described methodology and presented conclusions, were considered for inclusion.

The selected scientific publications were evaluated based on the following criteria:

1. Publication period from 2000 to 2025;
2. Publications written in English and/or Serbian;
3. Age of participants: senior category table tennis players;
4. Participants were male;
5. Participants underwent an experimental physical training intervention;
6. Participants' motor ability in strength was assessed.

The publications that met all selection criteria were analyzed according to the following parameters: reference (surname of the first author and year of publication), study design, participant sample (number of participants, age, sex, and number of groups), experimental treatment (program and duration), measurement instruments for assessing motor ability, and results.

Results

The procedure for collecting, analyzing, and eliminating the identified studies is presented in Figure 1. Based on the selected keywords, a total of 375 studies were identified. A total of 361 studies were excluded immediately based on their titles, duplicated records, and publication dates (older than the year 2000), while 14 studies were included for further analysis.

Through subsequent analysis of these 14 studies, an additional 6 were excluded based on several criteria: content of the abstract, classification as systematic review articles, absence of a control group, absence of an experimental training program, inclusion of female participants, and inadequate age of participants.

The remaining 8 studies met all inclusion criteria. These studies were published between 2000 and 2025, included senior male table tennis players, and assessed the motor ability of strength following a specific training intervention.

Figure 1. Statistical overview of the identified studies

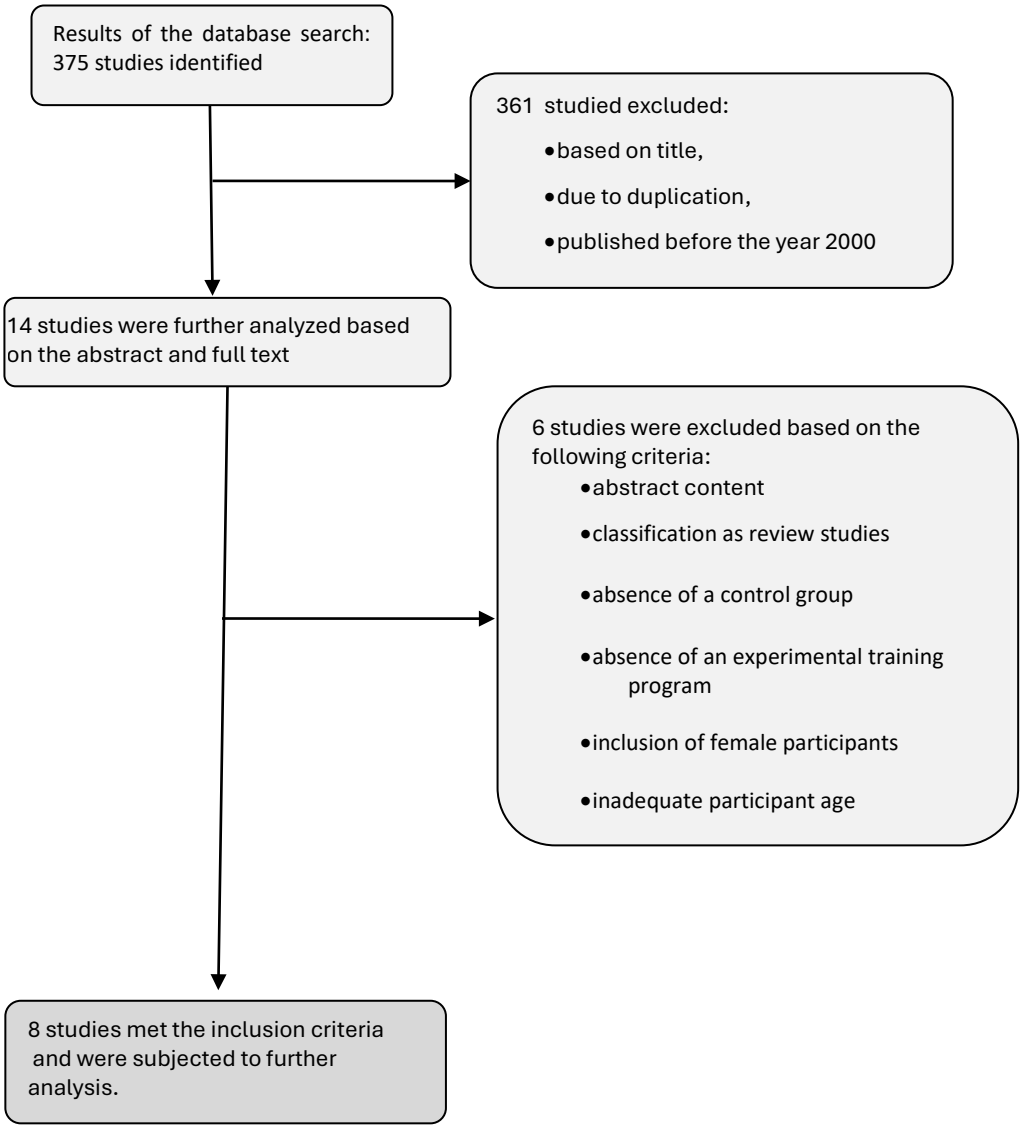

Table 1. Detailed analysis of the studies

First Author and Year	N	Age	G	Duration of the Training Program	Training Program	Assessed Motor Abilities (S)	Measurement Instrument	R
Zhu, X. et al. (2024)	40	19 ± 1.8 years	M	8W	RPT RPC	S	Bench press, Medicine ball throw	S ↑
Zhan, C. & Cui, P. (2023)	16	Profesional players	M	4W	WT (+30% load)	S	30 m sprint, Standing long jump	S ↑
Zaferanieh, A. et al. (2021)	30	24 ± 7 years	M	8W	BT PT	S	Grip strength, Vertical jump, Anaerobic strength	S ↑
Dong, K. et al. (2025)	11	20.22 ± 1.09 years	M	12W	PCT	S	Side bridge, Plank, Edgren side step	S –
Hu, C. et al. (2023)	92	Students		8W	SAS	S	Questionnaires Experimental tests of strength, Agility, Speed	S ↑
Chanavirut, R. et al. (2017)	30	19-28 years		6W	HBW	S	Dynamometer	S ↑
Meng, C. et al. (2023).	30	19.298 ± 0.708 years		9W	CST	S	50-meter sprint, Standing long jump, Seated forward bend, 800-meter run, "X" pattern forward-backward running	S ↑
Haghighi, A. H. et al. (2021)	30	24 ± 7 years	M	8W	PBT	S	Electromyography, Dynamometry, Explosive strength tests, Video analysis of technical strokes	S ↑

Legend: ↑-M-Male Participants, G-Gender, N-Number of Participants, W-Weeks, R-Results, RPT- Resistance & Plyometric Training (Traditional Sets), RPC- Resistance & Plyometric Training (Cluster Sets), WT- Weight Training, BT- Ballistic Training, PT- Plyometric Training, PCT- Periodized Core Training, SAS- Strength, Agility & Speed Training, HBW- Home-Based Training with Water-Filled Bucket Resistance, CST- Combined Strength and Traditional Training, PBT- Power and Ballistic Training

Discusion

Table 1 presents an overview of studies examining the effects of different training programs on the development of strength in senior category table tennis players. Analysis of the table shows that the studies were systematized and evaluated across nine parameter categories: reference, age and gender of participants, sample size, program duration, training program, assessed motor abilities, measurement instruments used for assessment, and the results obtained after the applied training program.

The number of participants in the studies ranged from 16 (Zhan, C. & Cui, P., 2023) to 92 (Hu, C. et al., 2023), and all participants were male. In all studies, muscular strength was examined as one of the assessed motor abilities. The duration of the training programs varied from a minimum of 4 weeks (Zhan, C. & Cui, P., 2023) to a maximum of 12 weeks (Dong, K. et al., 2025), with a weekly frequency of three sessions.

The tests used to assess strength in senior table tennis players included bench press, medicine ball throw (Zhu, X. et al., 2024), standing long jump, triple jump (Zhan, C. & Cui, P., 2023), grip strength, vertical jump, anaerobic strength (Zaferanieh, A. et al., 2021), side bridge, plank (Dong, K. et al., 2025), questionnaires, experimental strength tests (Hu, C. et al., 2023), dynamometer (Chanavirut, R. et al., 2017), long jump (Meng, C. et al., 2023), electromyography, dynamometry, and explosive strength tests (Haghighi, A. H. et al., 2021).

Statistically significant effects following the applied training programs were observed in the studies by Zhu, X. et al., 2024; Zhan, C. & Cui, P., 2023; Zaferanieh, A. et al., 2021; Hu, C. et al., 2023; Chanavirut, R. et al., 2017; Meng, C. et al., 2023; and Haghighi, A. H. et al., 2021, whereas no statistically significant effects were reported in the study by Dong, K. et al., 2025.

Based on the results of the analyzed studies, it can be observed that different training models, such as plyometric, isometric, resistance, and combined training approaches, have a significant impact on the development of muscular strength in senior table tennis players. Therefore, it is recommended to implement strength training programs lasting six to eight weeks, with a weekly frequency of three sessions, to achieve optimal improvements in table tennis-specific muscular strength.

Conclusion

Based on the analyzed studies, it can be concluded that the area of strength development in table tennis players is insufficiently represented in the scientific literature, particularly concerning the senior category. Although table tennis may initi-

ally appear as a sport dominated by speed, coordination, and precision, contemporary trends indicate that muscular strength is increasingly important for achieving elite performance. The rise in game speed, acceleration of stroke exchanges, and the need for explosive reactions have made strength development one of the key components of modern table tennis preparation.

A synthesis of the results from various studies indicates that the application of programs based on plyometric, combined, ballistic, or functional approaches leads to significant improvements in muscular strength parameters. Programs lasting six to eight weeks, with a frequency of three training sessions per week, have proven most effective in enhancing different strength components. Improvements in these abilities have a direct impact on the precision, power, and efficiency of technical performance under competitive conditions.

Although the results suggest positive effects of different strength training programs, the number of studies focusing on senior table tennis players remains limited. It is necessary to conduct a greater number of studies encompassing various training modalities, longer timeframes, and specific variables that reflect the actual demands of the game. Data from the analyzed studies (Zhu, X. et al., 2024; Zhan, C. & Cui, P., 2023; Zaferanieh, A. et al., 2021; Hu, C. et al., 2023; Chanavirut, R. et al., 2017; Meng, C. et al., 2023; Haghighi, A. H. et al., 2021) indicate the need for the systematic inclusion of strength development programs in the regular training process of table tennis players, with controlled load progression and individualized approaches.

Given that modern table tennis is characterized by high dynamism, accelerated game pace, and increasing demands for powerful and explosive movements, strength development represents one of the key prerequisites for achieving elite results. Strength should occupy an equally important role within the physical preparation of table tennis players, as it allows for greater efficiency in executing technical elements, ultimately contributing to the overall enhancement of athletic performance.

Significance of the study

The significance of this review study lies in providing systematic and reliable information on the effects of different training programs on the development of strength in senior category table tennis players. The information obtained through this research will enable coaches and specialists to systematically consider various approaches to strength development, offering a comprehensive overview of the

effects of different training programs on player performance. Such systematization will contribute to a better understanding of the specific demands of modern table tennis and facilitate the creation of individualized training programs. In this way, the results of this study may have practical applications not only in working with senior players but also in laying the foundation for the long-term development of younger age categories.

Conflict of interests:

The authors declare no conflict of interest.

Author Contributions:

Resources, Đ.P. and S.Đ.; Methodology, S.Đ.; Investigation, S.Đ. and Đ.P.; Data curation, Đ.P. and S. Đ.; Formal Analysis, Đ.P. and S.Đ.; Writing – original draft, Đ.P.; Writing – review & editing, Đ.P.and S.Đ.;

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MOTIVATION FOR PHYSICAL ACTIVITY AMONG ATHLETES AND RECREATIONAL PARTICIPANTS IN SERBIA

Katarina Gačević[1]

Abstract: The aim of this study was to examine the structure of motivation for engaging in physical activities among athletes and recreational exercisers, to analyze gender differences and the association between motivation and age, and to assess the reliability of the MPAM-R questionnaire in a domestic sample. The study included 175 participants from Serbia (78 athletes and 97 recreational exercisers; 70 men and 105 women), aged 16 to 67 years. The questionnaire includes five subscales: interest/enjoyment, competence, physical appearance, physical fitness, and social motives. The analyses included descriptive statistics, the Mann–Whitney U test, Spearman's correlation, and an assessment of instrument reliability (Cronbach's α). The most prominent motives among participants were competence (M=33.23) and interest/enjoyment (M=30.35), while social motives were the least represented (M=19.25). Athletes demonstrated significantly higher levels of interest/enjoyment (p=0.01), competence (p=0.02), and social motives (p=0.00) compared to recreational exercisers, whereas no significant differences were found in physical appearance (p=0.85) or physical fitness (p=0.85). No gender differences were observed across motivational dimensions (p values ranged from 0.06 to 0.27). Motivation was not significantly associated with age (p values ranged from 0.13 to 0.69). Cronbach's α coefficients for all subscales were high (α=0.92-0.97), confirming the reliability of the instrument. The findings highlight the predominance of intrinsic motivation in both athletes and recreational participants and provide practical implications for the design of sport and recreational programs aimed at promoting long-term engagement in physical activity.

Keywords: motivation; athletes; recreational exercisers; MPAM-R

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Introduction

Motivation is defined as the energy, direction, and persistence of behavior (Ryan & Deci, 2020). It is the driving force of all human activities. Motives are internal factors that initiate, direct, and regulate activities in order to achieve specific goals.

Extrinsic motivation originates from external sources, such as rewards, or pressures from others, whereas intrinsic motivation is characterized by feelings of satisfaction and enjoyment derived from performing the activity itself, rather than from external incentives. Numerous studies emphasize that intrinsic motivation contributes to higher-quality engagement and autonomous development, while extrinsic motivation can serve as an important incentive, particularly when intrinsic motivation is absent or still developing (Nikolić Vesković, 2023).

Research has shown that there are gender and age related differences in motivation for physical exercise. Older participants tend to emphasize health and physical fit-ness, whereas younger individuals highlight personal goals and achievements as primary motives (Nikolaidis et al., 2019). Similar motivational patterns have been observed among young athletes in Serbia, where predominantly intrinsic motives prevail, including the satisfaction of personal needs, health, and achievement, while money, popularity, and entertainment are not primary motives (Bačanac et al., 2007). Dominant motive among young people, regardless of gender, is the acqui-sition of physical fitness, however, physical appearance ranks second among wo-men, while interest and enjoyment are more prominent among men (Vašičková et al., 2014). Women are more often motivated by physical appearance and social motives, whereas men more frequently report competence and physical fitness as key motives (Šimunić & Barać, 2011).

Studies employing the Motives for Physical Activities Measure–Revised (MPAM-R; Ryan et al., 1997) indicate that physical fitness is the most dominant motive regardless of gender, while among older participants' physical fitness and health emerge as leading motives (Candace et al., 2021). Differences have also been identified between individual and team sports, with athletes engaged in team sports demonstrating stronger motives related to interest and enjoyment compared to those participating in individual sports (Jakobsen, 2014).

Motives for participation in physical activities change across the lifespan. Recreational exercisers primarily engage in physical activities to satisfy health-related and psychological needs such as physical condition, enjoyment, and well-being, rather than competitive motives, as shown in large population studies of leisure activity motivation (Elmose-Østerlund et al., 2023). In contrast, athletes tend to report stronger intrinsic motives related to enjoyment and mastery, while recreational exercisers often emphasize fitness and appearance motives (Kilpatrick et al., 2005).

There is a limited number of studies that directly compare the structure of motivation between athletes and recreational exercisers using a single, internationally validated instrument such as the MPAM-R. Most existing research focuses on the motivation of recreational exercisers (Duncan et al., 2010; Molanorouzi et al., 2015; Nikolaidis et al., 2019), motivation within specific team or individual sports (Jakobsen, 2014; Bačanac et al., 2007), or motivation in the context of particular competitions (Nikolaidis et al., 2019). Studies attempting to compare motives between athletes and recreational exercisers are scarce, and those available often employ different measurement instruments, which limits the possibility of direct comparisons (Frederick & Ryan, 1993).

Based on the above, the aim of this study was to examine the structure of motivation for engaging in physical activities among athletes and recreational exercisers, as well as to analyze gender differences and the relationship between motivation and participants' age. An additional aim was to assess the reliability of the MPAM-R questionnaire in the studied sample. It is expected that the obtained results will contribute to a better understanding of motivational processes in sport and recreation and will be of significance for future research in the fields of physical culture and psychology.

Based on previous research and the theoretical framework of motivation in physical activity, the following hypotheses were formulated:

H1: Athletes will report higher levels of intrinsic motivation (interest/enjoyment and competence) and social motives compared to recre-ational exercisers.

H2: There will be gender differences in motivation for physical activity, with women reporting higher physical appearance and social motives, and men reporting higher competence and physical fitness motives.

H3: Age will be significantly associated with motivation, such that older participants will report stronger physical fitness motives, while younger parti-cipants will report stronger intrinsic motives.

H4: The MPAM-R questionnaire will demonstrate high internal consistency in the domestic sample.

Methods

Participants

The study was conducted on a sample of 175 participants from the Republic of Serbia who regularly engage in physical activities, including 78 athletes and 97 recreational exercisers. The sample comprised 70 men and 105 women. Participants' age ranged from 16 to 67 years.

Athletes were participants who compete in individual or team sports, take part in official national championships or recognized leagues in Serbia, train five times per week, and are part of the organized sports system. Recreational exercisers engage in any form of physical activity at least three times per week, with each session lasting a minimum of 60 minutes.

The mean age of athletes was 22.26 ± 4.93 years, while the mean age of recreational exercisers was 32.94 ± 11.52 years. The mean age of male participants was 26.41 ± 8.90 years, while the mean age of female participants was 29.27 ± 12.04 years.

Participation in the study was anonymous and voluntary, and completion of the questionnaire required approximately 5 minutes. Prior to participation, all participants were informed about the purpose and objectives of the study.

Instrument

Motivation for engaging in physical activities was assessed using the Motives for Physical Activities Measure–Revised (MPAM-R; Ryan et al., 1997). The questionnaire consists of 30 items grouped into five subscales measuring specific categories of motives: interest/enjoyment (example: “Because it is fun”), competence (example: “Because I want to acquire new skills”), physical appearance (example: “Because I want to improve my appearance”), physical fitness (example: “Because I want to maintain my physical health and well-being”), and social motives (example: “Because I want to meet new people”).

All items are rated on a seven-point Likert-type scale (1 = does not apply to me at all, 7 = applies to me completely). Participants were asked to indicate the extent to which they agreed with each statement. Scores were calculated as the mean of the responses to all items belonging to the respective subscale, with higher scores indicating higher levels of motivation. In addition to the motivation questionnaire, participants provided information regarding gender, age, and whether they engaged in physical activity at a recreational or competitive level.

The study was conducted using a questionnaire survey that was distributed to participants in electronic form. Data were collected during April and May 2024.

This questionnaire allows for the assessment of motivation in both athletes and recreational exercisers, of which competence and interest/enjoyment predominantly represent intrinsic motives, whereas physical fitness, physical appearance, and social motives are considered extrinsic.

Statistical Analysis

Prior to data analysis, mean scores were calculated for each subscale, corresponding to each motivational dimension assessed by the questionnaire. The reliability of the instrument was evaluated using Cronbach's alpha coefficient (Cronbach's α). Normality of data distribution was assessed using the Kolmogorov–Smirnov test. As the assumption of normality was not met, non-parametric statistical procedures were applied. Descriptive statistics were used to present the structure of motivation, including the arithmetic mean (Mean), standard deviation (SD), minimum (Min), and maximum (Max) values.

Differences in motivational dimensions between groups (athletes vs. recreational exercisers) and between genders (men vs. women) were examined using the Mann–Whitney U test.

The relationship between participants' age and motivation was examined using Spearman's rank-order correlation. The level of statistical significance was set at $p < 0.05$. Statistical analyses were performed using SPSS software, version 25 (IBM Corp., Armonk, NY, USA).

Results

Table 1. presents the reliability coefficients (Cronbach's α) for all subscales of the motivation measurement instrument. As shown in the table, Cronbach's α coefficients for all subscales exceed 0.90, indicating high internal consistency and excellent reliability.

Table 1. Reliability coefficients (Cronbach's α) for all subscales

Subscale	α
Interest/Enjoyment	0.97
Competence	0.97
Physical Appearance	0.94
Physical Fitness	0.96
Social Motives	0.92

Note: α - Cronbach's alpha coefficient

Table 2. presents descriptive statistics for variables related to the structure of motivation for engaging in physical activities for the entire sample. The results indicate that motives related to competence acquisition were the most pronounced (*M*=33.23), whereas social motives were the least pronounced (*M*=19.25). The remaining motives-interest/enjoyment, physical appearance, and physical fitness were moderately expressed and showed similar mean values.

Table 2. Descriptive statistics of the motivation structure for physical activity

Subscale	N	Min	Max	Mean	SD
Interest/Enjoyment	175	9.00	42.00	30.35	11.14
Competence	**175**	**7.00**	**49.00**	**33.23**	**13.33**
Physical Appearance	175	6.00	42.00	25.60	10.73
Physical Fitness	**175**	**5.00**	**35.00**	**25.58**	**9.26**
Social Motives	175	5.00	35.00	19.25	9.01

Note: N - number of participants, Min - minimal value, Max - maximal value, Mean - arithmetic mean, SD - standard deviation

Table 3. shows the mean scores for motivational dimensions among athletes and recreational exercisers. For both groups, competence was the strongest motive (athletes: *M*=35.23; recreational exercisers: *M*=31.62), while physical appearance was lowest for athletes (*M*=21.73) and social motives were lowest for recreational exercisers (*M*=17.25). The Mann–Whitney U test revealed that athletes scored significantly higher than recreational exercisers in interest/enjoyment, competence, and social motives ($p < 0.05$), with no significant differences in physical appearance or fitness motives ($p > 0.05$).

Table 3. Mean scores and differences in the structure of motivation for physical activity between athletes and recreational exercisers (Mann–Whitney U test)

Subscale		N	Mean	U	Z	p	Effect Size
Interest/Enjoyment	**Athletes**	**78**	**32.08**	**2976.50**	**-2.44**	**0.01**	**0.18**
	Recreational exercisers	**97**	**28.96**				
Competence	**Athletes**	**78**	**35.23**	**3026.00**	**-2.28**	**0.02**	**0.17**
	Recreational exercisers	**97**	**31.62**				
Physical Appearance	**Athletes**	**78**	**25.76**	**3719.50**	**-0.19**	**0.85**	**0.01**
	Recreational exercisers	**97**	**25.47**				
Physical Fitness	**Athletes**	**78**	**25.18**	**3720.50**	**-0.19**	**0.85**	**0.01**
	Recreational exercisers	97	25.91				
Social Motives	Athletes	78	21.73	2704.00	-3.24	0.00	0.25
	Recreational exercisers	97	17.25				

Note: N - number of participants, Mean - arithmetic mean, U - Mann–Whitney U statistic, Z - standardized test statistic, p - significance level (p-value)

The results of the Mann–Whitney U test did not reveal statistically significant differences between men and women in any of the five motivational dimensions (Table

4.). Although women demonstrated slightly higher mean scores across all motives, the observed effect sizes were small and negligible.

Table 4. Mean scores and differences in the structure of motivation for physical activity between men and women (Mann–Whitney U test)

Subscale		N	Mean	U	Z	p	Effect Size
Interest/Enjoyment	Men	70	28.94	3209.50	-1.43	0.15	-0.11
	Women	105	31.29				
Competence	Men	70	31.60	3186.00	-1.49	0.14	-0.11
	Women	105	34.31				
Physical Appearance	Men	70	23.89	3056.50	-1.89	0.06	-0.14
	Women	105	26.74				
Physical Fitness	Men	70	24.76	3241.00	-1.34	0.18	-0.10
	Women	105	26.13				
Social Motives	Men	70	18.27	3311.00	-1.11	0.27	-0.08
	Women	105	19.90				

Note: N - number of participants, Mean - arithmetic mean, U - Mann–Whitney U statistic, Z - standardized test statistic, p - significance level (p-value)

Table 5. presents the results of Spearman's correlation analysis, which indicate that there is no statistically significant association between participants' age and motivation for engaging in physical activities ($p > 0.05$).

Table 5. Correlations (Spearman's r) between participants' age and motivation

Subscale	r	p
Interest/Enjoyment	-0.07	0.35
Competence	-0.09	0.20
Physical Appearance	-0.03	0.69
Physical Fitness	0.11	0.14
Social Motives	-0.12	0.13

Note: r - Spearman's correlation coefficient; p - significance level (p-value)

Discussion

The results of the present study indicate that motives related to competence and interest/enjoyment were the most pronounced among participants, whereas social motives were the least represented. These findings support Self-Determination Theory, which emphasizes that intrinsic motivation-including the pursuit of competence and enjoyment of the activity itself-plays a crucial role in long-term engagement in physical activities (Deci & Ryan, 2000).

The analysis of differences between athletes and recreational exercisers showed that athletes reported significantly stronger motives related to interest/enjoyment, competence, and social motives. This finding highlights the importance of the social environment and team dynamics in the sporting context, which is consistent with previous research (Allen, 2003). Accordingly, hypothesis 1 (H1) was confirmed, indicating that athletes demonstrate higher intrinsic and social motivation compared to recreational exercisers. In contrast, recreational participation in physical activity is more often oriented toward individual goals, such as improving health, physical fitness, or physical appearance, which may reduce the importance of the social component of motivation (Frederick & Ryan, 1993). Motivation related to physical appearance and physical fitness did not differ between athletes and recreational exercisers, suggesting that these extrinsic motives may play a less prominent role in the overall motivational structure.

The results further indicate that there were no gender differences in motivation, which supports findings suggesting a reduction in traditional gender differences in motivation for physical activity (Teixeira et al., 2012). Consequently, hypothesis 2 (H2) was not supported, as no statistically significant gender differences were observed across motivational dimensions. Spearman's correlation analysis did not reveal a significant association between age and motivation, pointing to a relative stability of motivational structure across different age groups (Candace et al., 2021; Jakobsen, 2014). Therefore, hypothesis 3 (H3) was not confirmed.

The findings are consistent with previous studies demonstrating that basic intrinsic motivation remains present regardless of activity type, gender, or age (Molanorouzi et al., 2015; Adamczak & Bronikowski, 2025). Intrinsic motives, such as competence and interest/enjoyment, directly influence the frequency, intensity, and long-term sustainability of physical activity, whereas extrinsic motives, such as rewards and popularity, are not dominant (Li et al., 2022; Duncan et al., 2010; Alecu et al., 2025).

The reliability analysis of the instrument revealed very high Cronbach's alpha coefficients for all subscales, confirming that the MPAM-R is a reliable and applicable instrument for measuring motivation for physical activity in the domestic context. In this regard, hypothesis 4 (H4) was confirmed**,** as the questionnaire demonstrated high internal consistency in the examined sample. This finding is particularly important for future research in the field of sport and recreation in Serbia.

Despite providing valuable insight into the motivational structure of athletes and recreational exercisers, several limitations of the study should be acknowledged. The sample was a convenience sample collected via an online questionnaire, and variables were assessed using self-report measures, which may introduce subjective bias

and socially desirable responding. Additionally, differences between individual and team sports, as well as the competitive level of athletes, were not examined, representing potential directions for future research.

Despite these limitations, the results contribute to a better understanding of motivational processes in sport and recreation and may have practical implications for the design of training and recreational programs that foster intrinsic motivation, the development of competence, and social connectedness among participants. The predominance of intrinsic motives, particularly competence and interest/enjoyment, suggests that programs designed to promote long-term engagement in physical activity should prioritize skill development, autonomy-supportive environments, and enjoyment rather than relying solely on external incentives. For sport clubs and training systems, fostering competence through progressive challenges and constructive feedback may enhance athlete retention and performance sustainability.

Furthermore, the significantly stronger social motives observed among athletes highlight the importance of team dynamics, group cohesion, and interpersonal relationships within organized sport. From a sport management perspective, these findings emphasize the value of creating supportive social climates, effective communication strategies, and group-based training formats. In the recreational sport and fitness industry, understanding motivational profiles may assist managers and instructors in tailoring programs that increase customer satisfaction, adherence, and loyalty, thereby contributing to the overall success and sustainability of sport and recreational services.

Conclusion

This study examined the structure of motivation for engaging in physical activity among athletes and recreational exercisers, as well as gender differences, age associations, and the reliability of the MPAM-R questionnaire. The findings indicate that motivation is predominantly intrinsic, with competence and interest/enjoyment emerging as the most prominent motives, while social motives were the least expressed. Athletes demonstrated stronger intrinsic and social motives than recreational exercisers, whereas no gender differences or age-related associations were identified. The high reliability coefficients confirm the applicability of the MPAM-R in the domestic context.

The practical implications of these findings suggest that physical activity programs may be more effective if they deliberately foster intrinsic motivation, support the

development of participants' competence, and, particularly in athletes, strengthen social connectedness and team dynamics. For future research, the use of larger and more representative samples is recommended, along with the inclusion of qualitative methods and additional variables such as type of sport, frequency of exercise, and psychological well-being. A longitudinal approach could contribute to monitoring changes in motivation across sports careers, while further testing of the MPAM-R questionnaire may confirm its stability and reliability in the domestic population.

This study provides meaningful insight into the similarities and differences in motivation between athletes and recreational exercisers in Serbia, contributing to the understanding of motivational processes and offering a foundation for the development of programs that promote long-term engagement in physical activity. These findings are relevant not only for coaches and physical education professionals, but also for sport managers, fitness industry stakeholders, and policymakers responsible for designing strategies aimed at increasing physical activity participation and retention.

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MODEL CHARACTERISTICS OF THE MORPHOFUNCTIONAL STATE OF HIGHLY QUALIFIED ATHLETES FROM VARIOUS SCHOOLS PRACTICING SANDA

Natalia Nikolaevna Zakharyeva [1]

Abstract: This article presents data from a comparative analysis of the morphofunctional state, physical qualities, and functional fitness parameters of highly skilled Sanda athletes from Russia and the athletes from Republic of China. Based on physiological testing data, differences identified in morphofunctional status, respiratory muscle development and pulmonary ventilation, limb muscle hypertrophy, psychophysiological characteristics of reflex response speed and accuracy, and mental and physical aerobic capacity. This allowed us to identify key parameters for constructing useful models for assessing the functional fitness of elite martial artists. Results. Russian martial artists are distinguished by: 1.a high level of myofibrillar hypertrophy in the upper limb muscles; 2. development of maximum voluntary muscle strength in the upper limbs; 3.significant accuracy and speed of response to stimuli in the "Reaction to Light" and "Reaction to a Moving Object" tests; 4. a high ability to resist fatigue when solving cognitive tasks of increasing complexity; 5. a high level of coordination and aerobic endurance, indicating a high level of sensory and central reflex development. These advantages enable Russian athletes to effectively perform in grabs, strikes, and throws, which involve the muscles of the upper limbs. Chinese athletes show predominantly myofibrillar hypertrophy in the thigh and lower leg muscles, enabling them to more effectively deliver kicks to the opponent's head, torso, and thigh using kicking techniques. The most informative test for assessing the coordination abilities of martial artists is the "Target" test, performed in a classic imitation-mimicking fighting stance. Among the tests characterizing the specialized performance of martial artists, the "Shuttle Run" test (3 x 10 m (sec)) is the most informative, demonstrating the highest degree of reliable differences. The key points for modeling the functional fitness characteristics of martial artists were indicators of aerobic fitness and upper limb muscle strength. The identified range of aerobic endurance and maximum voluntary hand muscle strength development can serve as a guide for focusing physical training loads on elite, highly skilled martial artists from various global Sanda schools.

Keywords: Sanda, martial arts masters, model characteristics, functional fitness, muscle strength, precision of muscle efforts, physical performance, cardiorespiratory system, psychophysiology, morphofunctional characteristics

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Introduction

Currently, throughout the world, including in Russia, Serbia, the United States, and especially in Southeast Asia, the number of sports schools and clubs actively promoting martial arts and Sanda (judo, karate, sambo, freestyle and Greco-Roman wrestling, boxing, Kyokushin, etc.) among various segments of the population is growing (Zakharyeva, 2025). Sanda (ancient Chinese kickboxing), a widely known style of Chinese martial arts, can be defined as a martial art that combines elements of traditional Chinese boxing and modern martial arts, featuring elements of Quan Fa with full-contact combat techniques, realistic combat scenarios, and very strict training methods (Zhang, 2018). Sanda is a system that combines the art of practical and highly effective hand-to-hand combat (散打) and the practices of traditional wushu (kicking (踢腿) and punching (冲孔, 冲孔), throws and grabs), modern self-defense methods and elements of combat systems, where fighters, as in many other martial arts, divided into age and weight categories (Maslov, (n.d.). The technique and methodology of teaching oriental martial arts in the PRC has come a long way from ritual dances and theatrical performances to a method of effective protection/self-defense/defense against attack and the achievement of spiritual perfection of the martial artist, achieving self-realization in martial arts (Maslov, (n.d.). At the same time, the style in which the fighters trained was not essential. The Sanda fighting technique itself included the most lethal possible techniques and movements, which honed to perfection and kept secret in various martial arts schools (Figure 1).

Figure 1. A leg grab technique traditionally used by Sanda martial artists since ancient China.

Over time, the study of martial arts in the PRC evolved into a sophisticated science that encompassed body and palm control, energy management, and internal strength. It combined the development of the body's physical qualities and functional reserves, physical and cognitive abilities, tactical thinking, and mind control. Over time, knowledge of combat and tactical training for athletes supplemented in martial arts schools with medical knowledge of acupuncture and Shuatsu massage, which involves altering a person's state through the application of acupuncture points. Over the course of many centuries of combat experience, which China forced to acquire due to historical events and wars, Sanda systematized and streamlined, developing into a system for training fighters and later encompassing the training of professional athletes practicing martial arts. Currently, national teams of various ages and sporting qualifications from China and the Russian Federation actively participate and win prizes in martial arts and Sanda competitions at European and Asian championships, world championships, and the World Youth Games. However, modern Sanda fighters, actively competing in the international arena, experience intense, and often extreme, physical exertion daily, as they are forced to compete in highly competitive environments. This necessitates scientific research to identify new, effective criteria for the selection of athletes based on the development of models characterizing the level of development of the athlete's morphofunctional state (Podrigalo et al, 2021; Norton, K Olds, 2001; Volodchenko, et al 2017). It has been established that for achieving success in long-term training in martial arts and Sanda, the following are important: technical, tactical, psychological, and physical preparation, belonging to a certain somatotype, and typological characteristics of the central nervous system: strength/weakness, the ability to differentiate inhibition, mobility, and balanced nervous processes (Martínez-Mireles, et al 2025). Most martial arts are characterized by speed-strength work with the presence of static tension, the competitive activity of athletes is carried out in the submaximal power zone, with a predominantly anaerobic/aerobic mode of work and high energy expenditure, when shifts in the work of the cardiorespiratory system reach maximum values, and there is an accumulation of lactic acid against the background of metabolic acidosis. Of particular importance for the development of the presented direction of scientific research are studies on the comparative analysis of the parameters of the morphofunctional state of highly qualified athletes practicing Sanda, from various ethnic groups and world martial arts schools (Podrigalo et al, 2021. Evaluation of a set of parameters of the morphofunctional state of highly qualified martial artists practicing Sanda, training in the world's leading martial arts schools - in China and Russia, will allow us to form a modern understanding of the standard of an athlete - a martial artist, which can serve as a reference point for coaches working with athletes - martial artists in various countries. The issue of creating useful

models that distinguish elite Sanda martial artists based on morphofunctional status parameters, which will improve sports selection, remains unresolved.

The purpose of the study: to determine differences in the parameters of morpho-functional state and develop model characteristics of functional fitness for martial artists practicing Sanda from Russia and China.

Research objectives:

1. to conduct a comparative analysis of the parameters of morphofunctional state, vertical stability, and its changes when athletes adopt simulated poses in simulated combat conditions; and the physical qualities of highly skilled martial artists from Russia and China practicing Sanda.

2. to determine differences in the characteristics of general and specific performance and its changes in simulated combat conditions in athletes of European and Asian ethnic groups practicing Sanda at the advanced stage.

3. to develop model characteristics of physical fitness for highly skilled martial artists from Russia and China practicing Sanda, based on morphofunctional state data.

Methods and Study organization

Physiological testing conducted on 41 Sanda athletes from Russia and China. All athletes were highly qualified Sanda practitioners. At the time of testing, all athletes had no acute or exacerbated chronic illnesses. Their athletic qualifications ranged from first adult sports category to Master of Sports of Russia. The Chinese martial artists had high athletic qualifications according to the criteria of Chinese sports categories. They regularly participated in Sanda competitions at various levels, from regional to Russian, Chinese, and World Championships, where they were champions and prize-winners. The average age of the subjects was 20.56 ± 2.5 years, the average training experience was 12.9 ± 3.5 years, and the average training load was 18.1 ± 7.7 hours per week.

The athletes divided into two comparison groups based on ethnicity:

Group 1 (gr1) - n=26 martial artists from the Russian Federation; n=26 martial artists from the Russian Federation; average age: 19.44±2.11; average length of service in martial arts: 11.10±0.92; average training load: 15.75±2.26 (hours per week)

Group 2 (gr2) - n=15 - ethnically belonging to the Mongoloid race, average age: 20.13±1.87 years; length of service: 10.99±1.91 years; training load (hours per week): 17.53±8.47 hours.

Inclusion criteria for athletes in the testing group:

1. Athletes with high athletic achievements;
2. More than 10 years of experience in Sanda;
3. No history of acute respiratory illnesses or exacerbations of chronic diseases at the time of testing;
4. A level of athletic qualification of at least the first adult sports category.

Exclusion criteria for athletes from the testing group:

1. Athletes without high athletic achievements;
2. Less than 10 years of experience in Sanda;
3. Acute respiratory diseases or exacerbations of chronic diseases at the time of examination;
4. Athletic qualification level below 1 adult sports category;
5. Unwillingness of the athlete to undergo physiological testing.

The scientific experiment was conducted in the "Medical and Biological Support of National Sports Teams" laboratory of the Research Institute of Sport and Sports Medicine of the Russian University of Sport "GTSOLIFK" (Moscow) during the hours of physiological sympathicotonia from 8:50 AM to 12:10 PM at a room temperature of 21.0 ± 1.0 °C; air humidity no more than 57%, in compliance with the ethical medical and biological standards set forth in the Declaration of Helsinki and the Directives of the European Community. Athletes participated in the physiological experiment voluntarily and informed about the safety of the research, the absence of harm to health, and the possibility of infection.

The study conducted during the hours of physiological sympathicotonia: from 8:50 a.m. to 12:20 p.m. and included a number of methods for examining the state of human functional systems, tests assessing the morphofunctional state, physical performance, and physical qualities of martial artists.

The following methods were use in the study:

1. Sociological methods: the survey conducted in person: the health of martial artists, the nature and severity of musculoskeletal and central nervous system injuries, and the presence of chronic diseases examined; sports genetics taken into account - information was collected on the presence of sudden death syndrome in the family and attacks of angina during training and competitions; recovery methods after intense physical exertion and competitions studied; motivation for practicing martial arts; the psychological stability of athletes before

competitions assessed; the level of aggression and stress resistance analyzed based on the athletes' subjective assessments.

2. Anthropometric methods: 1. assessment of total body dimensions: body length (in cm) was carried out using a VEROL 20022 medical stadiometer; Body weight assessment (in-kg) - carried out using MEHELECTRON-M VET-60-20-1S-AB (300x400) floor scales, chest circumference (in cm) measured using a centimeter tape; 2. body and limb circumferences: chest circumference at rest (cm), on inhalation and exhalation (cm); head, waist, shoulder, forearm, thigh and lower leg circumferences measured using standard methods (in cm); 3. subcutaneous fat fold thickness under the shoulder blade, on the abdomen, on the back of the shoulder, thigh, forearm, thigh and lower leg surface (in mm) measured using a MEDCA-m caliper.

3. Psychophysiological testing conducted using the IVPS 2.1 computer program (Koryagina Yu.V., Nopin S.V. (2001-2003)). Athletes performed tests assessing reflex responses to biologically significant stimuli: light, sound, moving object, choice reaction time (ms), and individual minute time (s).

4. The psychomotor performance of martial artists was assessed using the "URA" Mental Performance Computer Test (Sonkin V.V., Sonkin V.D., Zaitseva V.P. (2009)), with increasing cognitive load and varying information delivery speeds. The test completed in three stages of increasing difficulty;

5. Wrist and deadlift dynamometry (wrist dynamometer - DMER-120 and deadlift dynamometer - DS-500 RF);

6. Tonometry (semi-automatic tonometer Microlife BP A50) with determination of systolic (SBP) and diastolic DBP arterial blood pressure and heart rate (HR), then indirect methods were used to calculate cardiac performance indicators: SBV (systolic blood volume (ml) according to the Starr formula: 90.97+0.54×PP-0.57×DBP-0.61× Age, where: pulse pressure (PP) = SBP-DBP; DBP- is diastolic pressure, age (in year); minute blood volume (MBV) (l/min) = SBV × HR

7. Pulmonary ventilation assessed using spirometry (electronic Spirometer Spiro S-100; Moscow, Intoks) and functional respiratory tests of Stange and Genchi;

8. Heart rate monitoring (Polar H10) during functional tests;

9. PWC_{170} (bicycle ergometric) is a 2-stage test with a submaximal load modified by V.L. Karpman (1978). Absolute PWC_{170} values calculated using the formula:

$$PWC_{170}=W1+ (W2-W1)*(170 -\text{Heart rate1})/(\text{Heart rate2}-\text{Heart rate1})$$

where: W1 - is the power of the first load (W or kgm/min), W2 - is the power of the second load (W or kgm/min), HR1 - is the heart rate at the end of the first load (bpm), HR2 - is the heart rate at the end of the second load (bpm).

Cooper test (12-minute smooth run in standardized track and field conditions); VO2 max calculated = (D12 - 504.9)/44.73, where D12 is the distance covered in meters during the 12-minute test.

10. Flexibility - bench incline test (cm);

11. The study of coordination abilities conducted using the Stabilan-01-2 computerized stabilometer, manufactured by RITM Design Bureau, Taganrog. The following tests performed: 1. "Target" (two versions): 1.1. "Target" test performed in classic test with biofeedback and 1.2. "Target" test performed in a special imitation-imitative fighting stance; 2. "Stability in the Romberg pose" test on both legs and separately on the left and right legs with visual control and its limitation. To interpret the results, the integral and linear indicators of the stabilometric tests evaluated;

12. Tests for assessing special fitness adopted in martial arts:
    1. Stepping over a one-meter zone, performing two side steps in 30 seconds (points);
    2. Acrobatic sequence: long somersault + forward somersault from head and hands + backward somersault (points);
    3. Shuttle run 3*10m (sec);
    4. Sequence: Starting position – basic stance, forward somersault – from head and hands (through a bridge with an entry into the basic stance) – backward somersault, and return to the starting position (points).

13. Mathematical processing of the obtained data performed in Microsoft Excel and IBM SPSS Statistics

14. The nonparametric Mann-Whitney U-test used to calculate statistically significant indicators between independent samples.

Results of our own research

Forty-one highly skilled martial artists from Russia and China, who have successfully competed in Russian, Chinese, European, and World Championships and achieved high athletic results, participated in the physiological experiment. The anthropometric differences between the Sanda wrestlers from Russia and China presented in Table 1. No significant differences observed between the comparison groups for age,

body length (cm), and body weight (kg). Therefore, the athletes compared based on their morphofunctional status and functional fitness.

Table 1. Anthropometric indicators of martial artists from the Russian Federation and Sanda fighters from China

	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China. **gr2** (n=15)		P - level
Parameter	M	St.dev	M	St.dev	
Age (years)	19,38	3,11	21,13	2,77	0,17
Body length (cm)	177,14	11,32	181,00	6,67	0,32
Body weight (kg)	75,43	16,61	76,20	11,78	0,90
Chest circumferenceat rest (cm)	96,8	10,5	98,93	10,85	0,04*
Chest circumference on inhalation (in cm)	102,71	5,5	103,47	10,33	0,02*
Chest circumference on exhalation (in cm)	94,91	8,9	97,60	10,64	0,03*
Chest excursion (cm)	7,81	2,1	5,87	1,01	0,02*
Head circumference (cm)	55,2	4,2	58,73	2,46	0,05*
Waist circumference (cm)	63,63	10,23	80,00	9,55	0,04*
Shoulder circumference (cm)	45,79	13,00	35,67	7,52	0,05*
Forearm circumference (cm)	28,81	3,77	30,00	4,28	0,03*
Hip circumference (cm)	44,36	9,98	58,47	5,72	0,01*
Calf circumference (cm)	35,60	8,39	39,27	2,91	0,01*

Note: * – statistically significant differences.

The results presented in Table 1, the average values of the "Body Length" indicator in martial artists from the Russian Federation and China slightly exceed the standards for healthy untrained young men aged 19-20 (176.5-176 cm), the average values of the "Body Length" indicator in martial artists from the Russian Federation and China slightly exceed the standards for healthy untrained young men aged 19-20 (176.5-176 cm). The values of the "Body Weight" (kg) indicator and the chest circumference indicators in martial artists from the Russian Federation and China exceed the standards for healthy untrained young men aged 19-20 (60-62.2 kg and 91-92.2 kg, respectively). The chest excursion (CE) (chest circumference on inhalation (cm) - chest circumference on exhalation (cm)) is significantly greater in Russian martial artists than in Chinese athletes. In both comparison groups, the EGC

indicator is average (standards: <4 cm - low; 5-9 cm - average; 10 and > - high), however, in Russian athletes it is closer to high values. Characterizing body circumference measurements, it should be noted that the shoulder circumference measurements are significantly larger in Russian athletes ($p < 0.05$), while the circumference measurements of the forearm, waist, thigh and shin are larger in athletes from the PRC. A high degree of reliable differences established when comparing the girth measurements of the thigh and shin, priority noted for the development of the thigh and shin muscles in athletes from the PRC ($p \leq 0.01$).Thus, an analysis of the anthropometric comparison between Russian and Chinese martial artists revealed that Russian athletes have superior shoulder muscle development, enabling them to excel in grappling, striking, and throwing moves involving the upper extremities. These strikes are particularly valuable in Sanda and awarded 2 points by the referee. Compared to Russian athletes, Chinese athletes have superior thigh and calf muscle development, enabling them to more effectively deliver kicks to the head and torso. Furthermore, Chinese Sanda fighters are more likely to effectively strike an opponent's thigh using kicking techniques than Russian athletes, which can be awarded 1 to 2 points by the referee.

The characteristics of maximum voluntary muscle force (MVMF) values and its changes during dynamic and static physical exercise performed by martial artists from China and Russia presented in Table 2.

Table 2. Results of maximum voluntary muscle force and its changes during physical exercise performed by martial artists from Russia and China

Parameter	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China. **gr2** (n=15)		P - level
Maximum voluntary muscle strength of the right arm (daN)	52,24	9,61	49,14	7,96	0,02*
Maximum voluntary muscle strength of the left arm (daN)	50,47	9,26	46,59	8,11	0,05*
Maximum voluntary muscle strength of the right arm after 30 seconds of squatting at maximum tempo (daN)	53,26	9,42	48,13	9,46	0,03*
Maximum voluntary muscle strength of the left arm after 30 seconds of squatting at maximum tempo (daN)	50,68	10,70	45,93	9,34	0,02*
Maximum voluntary muscle force of the right arm after 90 seconds of jumping at maximum tempo (daN)	49,05	9,05	48,67	9,52	0,04*

Maximum voluntary muscle force of the left arm after 90 seconds of jumping at maximum tempo (daN)	48,99	5,08	46,63	9,47	0,05*
Maximum voluntary muscle strength of the right arm after performing a static load - holding the corner with outstretched arms for 1 minute (daN)	50,80	8,34	44,27	6,17	0,05*
Maximum voluntary muscle strength of the left arm after performing a static load - holding the corner with outstretched arms for 1 minute (daN)	49,82	7,35	40,60	6,08	0,05*
The coefficient of strength endurance of the right hand after 3 loads	0,98	0,08	0,92	0,20	0,05*
The coefficient of strength endurance of the left arm after 3 loads	0,94	0,10	0,91	0,19	0,05*

Note: * – statistically significant differences.

A comparative analysis of the maximum voluntary muscle strength (MVMS) of the right and left hands revealed significant intergroup differences, both in assessing the initial MVMS of both hands and in assessing the MVMS and strength endurance coefficient during dynamic and static loads. When assessing the initial indicator (measured in a standing position with feet shoulder-width apart and arms extended to the sides), the MVMS of the right hand was higher in martial artists from the Ru-ssian Federation, with a high degree of significant difference ($p < 0.02$), while the MVMS of the left hand in group 1 had a lower degree of significance ($p < 0.05$). After performing the first dynamic load (30-second squats at maximum tempo), the group of athletes from the Russian Federation (gr1) showed an increase in the MVMS predominantly for the right hand, with no changes compared to the initial values for the left hand. In the group of athletes from China (gr2), after the first dynamic phy-sical load, a decrease in the MPSM of the hands of the right and left hands by an average of 1 daN was noted. The coefficient of strength endurance (CSE) for the right hand was higher in athletes from China, and for the left hand it was higher in Russians; a highly reliable difference was noted ($p<0.02$). After the second dynamic physical load, performed in the glycolysis zone (90 s jumps at maximum tempo), both groups of athletes reduced the CSE of both hands. The values of the CSE were higher in Sanda fighters from China. A highly reliable difference was noted for the right hand ($p<0.02$). After performing a static load in the form of holding a corner with outstretched arms in gr1, the CSE va-

lues are very slightly reduced compared to the initial values of CSE for both hands. In Chinese Sanda wrestlers, measurements taken after static exercise showed significantly reduced MPSM values for both arms. The strength endurance coefficient after FN3 was higher in Russian athletes ($p<0.05$).

The analysis of the psychomotor performance of Russian martial artists and Chinese Sanda fighters conducted based on the athletes' psychophysiological tests using the computer program developed by Yu. V. Koryagina and S. V. Nopin (2001-2003). The results of the tests, reflecting the martial artists' ability to navigate in space and time, presented in Table 3.

Table 3. Psychophysiological indicators of martial artists from the Russian Federation and China

Parameter	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China **gr2** (n=15)		P - level
	M	St.dev	M	St.dev	
Reaction to light (ms)	221,74	12,69	237,68	18,90	0,02*
Response to sound (ms)	243,57	11,07	278,63	21,36	0,007*
Reaction to a moving object (number of leading reactions) (ms)	0,71	1,60	0,85	0,52	0,05*
Reaction to a moving object (number of delayed reactions) (ms)	0,29	1,38	1,24	0,46	0,008*
Choice reaction - mean value (ms)	326,17	13,19	297,26	17,10	0,01*
Individual minutes (s)	60518,71	707,94	62846,88	937,72	0,0001*

Note: * – statistically significant differences.

Martial artists from the Russian Federation are statistically distinguished by a faster reaction in the "Reaction to Light" and "Reaction to Sound" tests compared to gr2 athletes with a high level of reliable differences ($p < 0.007$). Sanda fighters from Chine are distinguished by a higher number of leading and lagging errors in the "Reaction to a Moving Object" test (ms), which may negatively affect their motor accuracy when striking an opponent and performing movements during fights. We obtained the data on the performance of martial artists in the "Reaction to a Moving Object" test coincide with the data obtained in the studies of A.N. Bleer (2009)[11]. The ability to differentiated inhibition, determined by the results of the "Choice Reaction Time" test (ms) is better in Sanda fighters from the Russian Federation. The most informative psychophysiological test, in terms of identifying intergroup diffe-

rences, is the "Individual Minute" test. It was found, that athletes from the Russian Federation (gr1) have almost perfect accuracy in the assessment of time (g1-g2 at $p<0.0001$), which indicates a high degree of development of their training.

The results of the third stage of the "Mental Performance" test for martial artists from Russia and China shown in Table 4.

Table 4. - Results of the "Mental Performance" tests (Sonkin V.V. 2009)

Parameter	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China. **gr2** (n=15)		P- level
	M	St.dev	M	St.dev	
URA, stage 2, interval 2, number of errors	1,00	0,82	0,13	0,35	0,02*
URA, stage 2, interval 10, number of errors	5,50	1,89	7,63	2,77	0,05*
Execution speed, (ms)	950,00	191,49	1125,00	103,51	0,06*

Note: * – statistically significant differences.

When comparing the results of the Mental Performance test, a significant difference was found in the second stage, based on the results of the second test attempt, with the Chinese martial artists showing an advantage, indicating a more complete and rapid adaptation to the increasingly complex cognitive task. It should be noted that Russian martial artists demonstrated greater psychomotor performance based on the results of the final attempts of the second and third stages of the URA test (Table 4), possessing a greater ability to resist fatigue when solving cognitive tasks of increasing difficulty ($p < 0.05$). Russian martial artists noted a higher speed of completing test tasks as the cognitive load increased, while noting a high degree of reliability of these differences.

Analysis of the cardiorespiratory parameters of Chinese Sanda fighters and Russian martial artists revealed a number of intergroup differences in test parameters characterizing cardiac and respiratory performance. The results of pulmonary ventilation parameters for highly skilled Sanda martial artists from Russia and China presented in Table 5.

Table 5. - Pulmonary ventilation parameters for highly skilled Sanda martial artists from Russia and China, based on spirometry data

Parameter	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China. **gr2** (n=15)		P - level
	M	St.dev	M	St.dev	
Tidal volume (ml)	1162,24	209,65	1100,00	140,83	0,05*
Inspiratory reserve volume (ml)	2359,29	542,96	2076,87	792,04	0,01*
Expiratory reserve volume (ml)	1228,24	440,12	1461,07	283,29	0,02*
Inspiratory capacity, (ml)	3247,95	637,28	2974,73	836,41	0,02*
Vital capacity of the lungs (ml)	4284,48	767,86	4106,87	741,57	0,05*
Maximum ventilation (L/min)	132,94	16,64	123,04	6,54	0,03*
Minute tidal volume (ml)	744,76	45,9	652,67	55,42	0,04*
Respiratory rate at rest per minute (breathing cycles per minute)	9,5	1,6	9,20	1,26	0,2

Note: * – statistically significant differences.

According to the data presented in Table 5, statistically significant differences in pulmonary ventilation indices established for all the presented parameters, which reflects clear advantages of pulmonary ventilation development in Russian martial artists (gr1). The parameter "Maximum pulmonary ventilation" (l/min) (g1-g2, at p≤0.03) is especially valuable for assessing the state of respiratory reserves; MVL values directly correlate with the development of training and reflect the state of respiratory reserves. Russian martial artists note a longer breath-holding time in the Stange test (sec): gr1 - 96.18±18.98(sec); gr2 - 90.40±13.76(sec) with highly reliable differences (g1-g2, at p≤0.006) and a higher level of oxygen concentration decrease according to the SpO2 index (in%) after apnea: gr1 - 93.54±5.79(sec); gr2 - 97.93±1.10(s) (g1-g2, p≤0.009).

Our research has shown that at rest, Russian martial artists have higher saturation levels than Chinese athletes (g1-g2, p≤0.02). During functional breathing tests, athletes in the g1 group are able to withstand more pronounced hypoxia with lower levels of hypoxemia: the difference in SpO2 after apnea in the Stange test between the g2 and g1 comparison groups was 4.38%, with statistically significant differences (g1-g2; p<0.009).

The results of cardiovascular performance indicators presented in Table 6.

Table 6. - Cardiovascular indicators in highly skilled martial artists practicing Sanda from the Russian Federation and China

Parameter	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China. **gr2** (n=15)		P - level
	M	St.dev	M	St.dev	
Heart rate (resting) (beats per minute)	72,43	13,10	68,07	5,11	0,17
Systolic blood pressure (at rest, sitting), (mmHg)	134,29	7,76	124,87	7,46	0,01*
Diastolic blood pressure (resting, sitting) (mmHg)	66,86	8,07	74,33	4,65	0,01*
Systolic blood volume (at rest), (ml)	83,42	7,71	69,52	4,65	0,0001*
Minute blood volume (at rest), (ml)	6069,81	800,41	4720,46	332,70	0,0001*
Pulse pressure (mmHg)	67,43	8,56	50,53	8,18	0,0001*
Mean hemodynamic pressure (mmHg)	83,87	34,45	96,06	4,46	0,18
SpO2 at rest (%)	98,58	3,61	98,27	0,80	0,91
Endurance coefficient (conventional units)	11,12	1,1	13,96	1,7	0,01*

Note: * – statistically significant differences.

The table 6 presents the data a high degree of reliable differences revealed, when comparing the results of the indicators Systolic blood volume (ml), Minute blood volume (ml) and pulse pressure (mmHg) (g1-g2, at p <0.0001), which is a sign of adaptive restructuring of the myocardium with an increase in the reserve of the pumping function of the heart under the influence of a high level of training. The values of the endurance coefficient (conventional units), calculated using the Kvaas formula, emphasize a decrease in the average value of the endurance coefficient noted among Russian martial artists, which indicates the development of fatigue during the performance of systematic intense physical activity; the value of the endurance coefficient (conventional units) among athletes from China corresponds to the norm (12-16 conventional units). One athlete from China (gr2) showed a significant increase in the value of the Endurance Coefficient - 23.75 conventional units, which is a sign of significant myocardial stress under conditions of developing tissue myocardial hypoxia and requires an in-depth medical examination. According to the analysis of individual Endurance Coefficient data, 33.3% (5 individuals) of Chinese Sanda fighters and 50% (13 individuals) of Russian martial artists showed a decrease in the endurance coefficient in the range from 8.53 to 11.12 conventional units,

indicating the development of fatigue after intense physical activity and requiring an individualized approach by the coach to prescribing physical activity during training and systematic monitoring of the cardiovascular system by sports physicians throughout the training process.

To assess the development of coordination abilities, martial artists from both comparison groups performed the “Target” test in an imitation of a classical fighting stance (Table 7; Figures 1–3).

Figures 1–3. A martial artist performing the "Target" test in a classical fighting stance

Table 7. - Stabilographic indices of highly skilled martial artists from Russia and China performing the "Target" test in a simulated classical fighting stance. Visual control.

Parameter	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China. **gr2** (n=15)		P - level
	M	St.dev	M	St.dev	
Frontal spread Q(x), (mm)	1,88	0,59	2,76	0,54	0,01*
Sagittal scatter Q(y), (mm)	2,32	0,48	2,66	0,81	0,379
Average spread R, (mm)	2,88	0,73	4,31	1,44	0,04*
Average speed of movement of the center of pressure V, (mm/s)	7,93	1,49	11,73	1,45	0,001*
Rate of change of statokinesiogram area SV, (sq. mm/s)	12,07	2,07	13,05	2,15	0,421
Ellipse area EllS, (mm2)	74,09	4,63	72,95	2,33	0,598
EllE compression ratio	1,42	0,35	1,78	0,37	0,09*
Length of the trajectory of the center pressure along the front, LX, (mm)	105,36		113,37	2,27	0,0001 *
Length of the trajectory of the center of pressure along the sagittal, LY, (mm)	109,87	3,36	117,30	7,01	0,02*
Quality of the equilibrium function, (%)	86,61	5,14	81,39	2,87	0,04*

Note: * – statistically significant differences.

As can be seen from Table 7, reliable differences in the comparison groups were established for "Average spread of R, mm"; "Length of the trajectory of the Center of Pressure along the sagittal, LY, mm" and "Quality of the equilibrium function, %". The maximum degree of reliability of differences was established when comparing the values of the indicators "Length of the trajectory of the Center of Pressure along the frontal, LX, mm" (g1 - g2; at $p < 0.0001$) and "Average speed of movement of the Center of Pressure V, mm/sec" (g1 - g2; at $p < 0.001$).

Thus, among the battery of stabilometric tests (Target, Romberg Stability, visual control, and visual limitation, performed in classical stances), the Target test, performed in a "simulated classical fighting stance" with visual control, was particularly valuable for identifying intergroup differences. This allowed us to identify advantages in the static characteristics of vestibular functions in Russian Gr1 martial artists.

Aerobic endurance indicators for athletes from the Russian Federation and Sanda fighters from the People's Republic of China obtained using the Kenneth Cooper test. The results of the Kenneth Cooper test for martial artists from the Russian Federation and the People's Republic of China presented in Table 8.

Table 8. Results of the Kenneth Cooper test for martial artists from the Russian Federation and the People's Republic of China

Parameter	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China. **gr2** (n=15)		P - level
	M	St.dev	M	St.dev	
Distance in the Cooper test (m)	42000	380,01	3070,00	270,19	0,05*
Maximum oxygen consumption (l/min)	4,18	0,56	3,42	1,54	0,34
rel Maximum oxygen consumption (l/min/kg)	58,18	8,43	51,61	2,21	0,05*

Note: * – statistically significant differences.

As Table 9 shows, Russian athletes have superior aerobic capacity compared to Chinese Sanda fighters, as reflected by the distance covered by the athletes in the Cooper test (m) (gr1 - gr2; $p < 0.05$). Using the formula adopted in sports physiology, absolute maximum oxygen consumption (MOQ) and relative maximum oxygen consumption (ROQ) calculated. Relative maximum oxygen consumption (ROQ) values significantly differed between the comparison groups (g1 - g2; $p < 0.05$).

A comparative analysis of the development of specialized endurance in martial artists from the Russian Federation and China conducted using the results of tests traditionally used in martial arts to assess specialized fitness (Table 10).

Table 10. Results of specialized fitness tests performed by martial artists from the Russian Federation and China.

Parameter	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China. **gr2** (n=15)		P - level
	M	St.dev	M	St.dev	
Stepping over a one-meter zone, performing 2 side steps in 30 seconds (points)	4,81	0,53	4,41	0,55	0,04*
Acrobatic combination: long somersault + forward somersault from head and hands + back somersault (points)	4,38	0,52	4,82	0,45	0,05*
Shuttle run 3*10m (sec)	6,38	0,24	7,38	0,26	0,004*
Connection: starting position - basic stance, forward somersault - from the head and hands (through the bridge with getting up to the basic stance) - backward somersault, return to the starting position (points)	9,5	0,27	8,40	2,19	0,05*

Note: * – statistically significant differences.

As evidenced by the test results, Russian martial artists performed better in most tests assessing athletes' specialized performance. These tests include: 1. Stepping over a meter-long zone, performing two side steps in 30 seconds; 2. Shuttle run 3*10m (seconds); 3. In the test, the combination: I.P. - O.S., forward roll - head and hands (through a bridge with an initial landing in O.S.) - backward roll, I.P. (points), which highlights the superior development of specialized endurance in Gr1 athletes. It has been established that martial artists from the Russian Federation have better development of aerobic endurance and special endurance, which, together with the high development of muscle strength in the upper limbs, a high level of development of psychomotor performance and motor precision in reactions to biologically significant stimuli and moving stimuli, and large reserves of the cardiorespiratory system, determines their success in the international arena.

According to scientific research professor S.E. Tabakov (2009 -2025), it is necessary to analyze the parameters of the morphofunctional state that determine the state of the muscular apparatus of the upper limb girdle and the performance of the cardiovascular system that adequately ensures the work of this apparatus.

Model characteristics of the functional fitness of athletes - highly qualified martial artists from the Russian Federation and China practicing Sanda are the indicators of aerobic fitness and muscle strength of the upper limbs. The established range of values for aerobic fitness: relative PWC170: 22.0 - 24.50 (kg / m / min / kg); aerobic endurance in the K. Cooper test: 3070 - 4200 (m); the indicator of relative. Maximum oxygen consumption PC: 51.61 - 58.18 (ml / min / kg); Maximum voluntary hand muscle strength: 49.14–68.67±10.67 kg, which can serve as a benchmark for the focus of physical training for highly skilled elite martial artists. Model characteristics of elite martial artists from the Russian Federation and China (range of aerobic performance parameter values) presented in Table 11.

Table 11. Model characteristics of elite martial artists from the Russian Federation and China (range of values of aerobic performance parameters and upper limb muscle strength).

Parameter	Martial artists from the Russian Federation **gr1** (n=26)		Sanda fighters from China **gr2** (n=15)		p - level
	M	St.dev	M	St.dev	
Distance in the Cooper test (m)	42000	380,01	3070,00	270,19	0,05
relative Maximum oxygen consumption (l/min/kg)	58,18	8,43	51,61	2,21	0,05
relative PWC_{170}, (kgm/min/kg)	22,66	0,26	24,51	0,41	0,36
Maximum voluntary muscle strength of the right arm (daN)	52,24	9,61	49,14	7,96	0,02*
Maximum voluntary muscle strength of the left arm daN	50,47	9,26	46,59	8,11	0,05*
Maximum voluntary muscle force of the right arm after 30 seconds of squatting at maximum tempo (daN)	53,26	9,42	48,13	9,46	0,03*
Maximum voluntary muscle force of the left arm after 30 seconds of squatting at maximum tempo (daN)	50,68	10,70	45,93	9,34	0,02*

Note: * – statistically significant differences.

The established range of aerobic fitness values can serve as a guideline for the focus of physical training for elite, highly skilled martial artists in both the People's Republic of China and Russia.

Discussion of Research Results

In modern scientific literature, there are studies on the comparative analysis of the functional state parameters of athletes practicing martial arts (James, et al., 2016; Plush, et al. 2021; Marinho, et al. 2016; Maling Shaolin Kung Fu Academy. (n.d.)). However, there is a clear lack of studies that have conducted a comparative analysis of the morphofunctional status parameters and functional fitness of highly qualified athletes training at leading global Sanda schools.This study presents a comparative analysis of the parameters of morphofunctional state, physical qualities, and functional fitness in highly skilled athletes, including elite athletes-World Champions, and Russian and Chinese champions-practicing Sanda. Differences in morphofunctional status, physical performance, the degree of respiratory muscle development and muscle hypertrophy in the limbs, psychophysiological characteristics of the speed and accuracy of reflex reactions reflecting the martial artists' spatial and temporal orientation, and mental, physical, aerobic, and mental performance identified among the identified differences in anthropometric parameters. Among the identified differences in anthropometric parameters, it is worth noting the differences in the priority given to the development of individual muscle fiber groups in the limbs of martial artists belonging to various global Sanda schools. Athletes from the Russian Federation distinguished by: the development of myofibrillar hypertrophy in the upper limb muscles, high chest excursion, a high level of maximum voluntary strength in the upper limb muscles, high precision and speed of response to stimuli in response to light and moving objects, a high ability to resist fatigue when solving cognitive tasks of increasing complexity, and a high level of coordination, indicating a high level of sensory and central reflex development. These advantages enable Russian athletes to perform high-quality grabs, strikes, and throws, which involve the muscles of the upper limbs. Such strikes are especially valuable in Sanda and are worth 2 points by the referee. Compared to Russian athletes, Chinese athletes have stronger thigh and calf muscles, enabling them to more effectively deliver kicks to the head and body, as well as kicks to the opponent's thigh using kicking techniques, than Russian athletes. The referee can be assessed this by with 1 to 2 points. Among the psychophysiological tests, the following tests are particularly noteworthy: "Reaction to Sound" (ms), "Reaction to a Moving Object" (ms), especially the "Number of Leading and Delayed Errors" parameters, and the results of the "Individual Minute" test (s).We recommend using such tests for the selection of martial artists for national teams. As Professors A.N. Bleer and V.V. Shiyan have shown based on their long-term studies of martial artists, martial artists who place first and in prizes in Sanda competitions do not exhibit leading errors when monitoring their RDO test results before competitions (Bleer, 2006). The most informative test for assessing

the coordination abilities of martial artists based on stabilometric testing data is the Target test, performed by athletes in a classic imitation-mimicking fighting stance. The Target and Romberg stability tests, which rely on visual control and its limitations, performed in classic stances, are not informative for identifying highly skilled martial artists who are successful in Sanda competitions held with athletes from various world schools. Russian martial artists report "excellent" results in the Kenneth Cooper test, demonstrating highly developed aerobic abilities. Among the tests characterizing the specialized performance of martial artists, the Shuttle Run (3 x 10 m (sec)) is the most informative, demonstrating the highest degree of reliable differences. In these tests, Russian athletes outperform Chinese Sanda wrestlers. These characteristics of morphofunctional development and functional fitness enable Russian martial artists to achieve high prizes in international competitions. To develop model characteristics of the physical fitness of highly skilled Russian and Chinese martial artists practicing Sanda, morphofunctional data used, determining the condition of the upper extremity girdle muscles and the performance of the cardiovascular system, which adequately supports this system (S.E. Tabakov (2009)). The focal points of the model characteristics of the functional fitness of martial artists were indicators of aerobic fitness and upper limb muscle strength. The identified range of aerobic endurance and maximum voluntary hand muscle strength develop-ment can serve as a benchmark for the physical training focus of elite, highly skilled martial artists from various global Sanda schools.

Conclusions

1. The functional fitness model characteristics of highly skilled Russian and Chinese martial artists practicing Sanda should be within the following ranges:

- aerobic fitness values: relative PWC170: 22.0 - 24.50 (kg/m/min/kg); - aerobic endurance values in the K. Cooper test: 4200 - 3070 (m); - relative VO2 max values: 58.18 - 51.61 (ml /min/kg);
- maximum voluntary hand muscle strength values: 49.14 - 68.67 ± 10.67 kg;
- strength endurance coefficient values: 1.0 ± 0.23; maximum voluntary deadlift values: 126.80 - 160.76 kg.

Conformity of martial artists to the model characteristics of functional fitness will contribute to the improvement of technical and tactical skills, can serve as selection criteria for national teams and will allow martial artists to be successful in competitions, which is relevant for both the Russian Federation and the People's Republic of China.

2. When assessing the level of development of coordination abilities in Sanda at the stage of athletic excellence, special attention paid to the stabilometric test "Target", ca-rried out in an imitation pose - a classic fighting stance, which allows for a quick and effective determination of the level of development of coordination abilities under the influence of intense physical activity.

3. Significant importance for the ongoing monitoring of the morphofunctional state of elite martial artists from the Russian Federation and China given to studying the strength characteristics of the upper limb muscles at rest and during physical activity, based on the results of dynamometry with an assessment of the strength endurance coefficient.

4. According to stabilometric tests characterizing the development of coordination abilities, performed by athletes in imitation of classical fighting stances, highly qualified martial artists from the Russian Federation outperform athletes from the People's Republic of China, which determines the advantages in the development of agility and allows athletes from Russia to take prizes at world championships.

5. During the physiological testing, reliable differences were established in anthropometric parameters and parameters of the cardiorespiratory, central nervous, and muscular systems; psychomotor performance; the level of development of aerobic and special endurance and maximum voluntary muscle strength of the upper limbs in martial artists from China and the Russian Federation. This reflected in the priority development of maximum voluntary muscle strength of the hands, higher values of the physiological parameters Maximum Oxygen Consumption, Maximum Pulmonary Ventilation, a greater distance in the K. Cooper test, a more responsive response to biologically significant stimuli, and a high level of development of aerobic and special endurance in martial artists from the Russian Federation compared to athletes from China.

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ACADEMIC GUIDANCE IN UNIVERSITY TRAINING SYSTEMS IN THE SPORTS FIELD: BETWEEN STUDENTS' ASPIRATIONS AND AVAILABLE PROFESSIONAL OPPORTUNITIES

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Abstract: This study examines the role of academic advising in university training systems within the sports field, with a particular focus on the relationship between students' aspirations and available professional opportunities in the labor market. The primary aim of the research was to investigate the perceived importance of academic advising among faculty members, students, and graduates in the fields of kinesiology and physical education, and to explore how effective academic support contributes to students' academic, psychological, and social adaptation while meeting quality standards in higher education.

The study involved a sample of key stakeholders in the training process (faculty members, current students, and alumni). Data were collected using a structured questionnaire. The results revealed a broad consensus among all respondent groups regarding the critical role of academic advising in guiding students according to their scientific capabilities and personal motivations, enhancing their academic performance, and facilitating successful integration into the professional field.

Keywords: Academic advising, Higher education quality, Labor market alignment, University training systems, Physical education, LMD system

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Introduction

Patterns of academic guidance and orientation at the university level vary significantly according to scientific specialization. While some disciplines rely primarily on cognitive abilities, others - such as motor sciences and physical education - require additional physical, athletic, and psychomotor competencies.

The general objective of physical education, as defined by Pierre Arnaud (1983), is to prepare socially responsible individuals capable of engaging effectively with social life. Achieving this objective depends heavily on the competencies of the physical educator within the educational process. However, as Gabriel Beshara (1986, p. 5) notes, despite widespread awareness in Arab countries of the teacher's importance, the teaching profession continues to struggle to attract outstanding individuals capable of shouldering the responsibility of educating future generations.

Every profession requires specific foundations, conditions, and skills. The teaching profession is no exception; it demands particular personal and professional characteristics in the educator, who serves as the primary agent in achieving educational goals and shaping learners' behavior. This systematic influence helps students achieve self-regulation, positive social adaptation, and meaningful contributions to societal development.

In today's context, students aspire to obtain high-quality qualifications that secure employment in an increasingly competitive labor market. Families seek comprehensive academic and personal preparation for their children, while governments aim to produce highly competent graduates capable of driving national development plans. These converging pressures have prompted national reforms aimed at enhancing the internal and external efficiency of higher education systems through improved quality assurance and outcome regulation.

In the field of motor sciences, the sharp rise in university enrollment in physical education programs has often exceeded the absorption capacity of training institutions (Alem, 2003). Consequently, universities and institutes must implement rigorous selection procedures to admit only the most qualified candidates. This principle is clearly emphasized in the UNESCO International Charter of Physical Education and Sport.

Like other university disciplines, motor sciences require students to receive accurate and timely information about program requirements, course structures, and administrative procedures. Academic advisors play a pivotal role in this process, extending beyond mere information provision to explanation, clarification, and ongoing guidance. Given that students must obtain the advisor's approval for most academic

decisions, this role demands patience, attention to detail, extensive experience, and thorough familiarity with academic regulations and study plans.

Nevertheless, because students' primary focus is often obtaining a degree, academic advising is sometimes perceived as a secondary concern, which may weaken its effectiveness. Moreover, the emergence of new specializations in the labor market can create challenges; students may discover late in their studies that they have enrolled in courses outside their program plan, potentially delaying graduation. Timely intervention by the student or the academic advisor is therefore essential.

The present study seeks to highlight the growing importance that contemporary societies attach to academic guidance and pedagogical support throughout students' university training. Effective academic advising represents a crucial step toward preserving the university's pedagogical standing, enhancing the value of its degrees, and improving graduates' social and professional recognition - thereby contributing to both individual fulfillment and societal benefit.

This research also aims to examine the key procedures of academic guidance in Algerian higher education programs in motor sciences, from student selection through academic progression to graduation and entry into professions aligned with students' abilities and interests.

Significance of the Study and Research Objectives

This study holds particular significance in the Algerian context, where youth unemployment (ages 15-24) stands at approximately 29.8% (World Bank, 2025), and graduates in physical education and sports sciences face acute challenges in labor-market integration due to skill mismatches and limited professional orientation. By providing an empirical comparison between the classical and LMD systems, the research contributes to evidence-based higher education policy and offers practical recommendations for strengthening academic advising. The main objectives are: (1) to assess the perceptions of faculty members, students, and graduates regarding the role and effectiveness of academic advising; (2) to compare procedures and outcomes between the two university systems; and (3) to identify strategies for better alignment between student aspirations and available professional opportunities.

In Algeria, numerous institutes have been established to train sports professionals capable of addressing shortages in educational institutions and sports clubs. Some of these institutes operate under university supervision (university-based training), while others fall under the Ministry of Youth and Sports (non-university higher tra-

ining). Both systems rely on competitive entrance examinations to select suitable candidates.

The issue of educator quality in physical education is not new. The rapid expansion of physical education teacher preparation programs has raised serious concerns about the quality of training, particularly regarding student selection and preparation (Alem et al., 2013). (As Al-Khouli 2002, p. 236) emphasizes, "The process of selecting physical education students … is one of the key inputs for developing the profession," because future teachers and coaches must demonstrate competencies across behavioral, cognitive, mental, physical, motor, emotional, and affective domains.

Consequently, teacher-training institutes bear a direct responsibility to society. They should not accept every applicant nor graduate every enrolled student; rather, they must carefully select individuals who possess the necessary qualifications and genuine aspiration to work in the sports education field.

In many developed countries, colleges and departments of physical and sports education regularly review and update their admission requirements. Ongoing research continues to generate new ideas for refining selection criteria through surveys, comparative studies, and case analyses (Al-Khouli, 2002, p. 237).

Several previous studies have examined pedagogical guidance in higher education, including works by Martens-Freed (1984), Bahri (1992), Kerfes (2015), Kerfes and Cloes (2006), and Alem, Kerfes et al. (2013). These studies consistently highlight the need to strengthen monitoring procedures for new students by granting a more prominent role to the academic advisor, as stipulated in Algeria's university education reform laws, particularly under the LMD system.

Such guidance contributes significantly to students' psychological, social, and academic adjustment, thereby supporting the development of a well-rounded personality. Psychological and educational counseling services have thus become an essential component of the modern university educational process. In addition to academic guidance, the university advisor often provides psychological support and helps address behavioral or emotional difficulties.

Under the classical university system in Algeria, several negative phenomena have been observed in motor sciences programs, including student disengagement in both theoretical and practical courses. Some students attribute this to inadequate initial guidance or mismatch between their baccalaureate stream and university requirements. Others exhibit negative attitudes during practical sessions, particularly those with limited motor skills, due to fear of failure or peer ridicule.

In contrast, the adoption of the LMD system, in which the supervising professor serves as a mentor providing continuous academic and psychological support, has offered students greater reassurance and better opportunities to plan their professional trajectories.

Despite ongoing pedagogical reforms, the current student selection tests in Algeria have remained largely unchanged for many years. Given the differences between the classical and LMD systems, the selection process through competitive examinations plays a critical role in aligning students' interests and motivations with their chosen specialization. This alignment is expected to enhance academic success, facilitate future professional integration, and ease the workload of academic advisors.

Accordingly, the present study seeks to answer the following research questions:

- Do current academic guidance procedures adequately meet the needs of Algerian universities and reflect societal aspirations?
- To what extent do faculty members, students, and graduates from both the classical and LMD systems agree on the definition and improvement of academic guidance procedures?
- What role does the academic advisor play in directing students toward careers that match their abilities and respond to labor market demands?

Theoretical Framework

The selection of students for higher education programs in physical and sports education requires the active involvement of multiple factors that enable applicants to acquire the necessary knowledge and practical experience in the field. Academic guidance plays a pivotal role in this process by raising students' awareness and strengthening their motivation toward university studies.

Information dissemination is a fundamental component of effective academic guidance. At the secondary school level, this occurs primarily through educational counselors and mass media channels, providing students with comprehensive data on available programs, specializations, and their specific requirements in physical and sports education institutes.

Guidance, in essence, is a systematic process aimed at achieving congruence between the student's individual characteristics (abilities, aptitudes, interests, and personality traits) and the diverse demands of educational and professional opportunities. Its ultimate goal is to create an environment that fosters personal growth

and facilitates success in both academic and professional domains (Super, 1957; Holland, 1997).

However, the process of choosing a field of study or an educational institution is often influenced more by parental preferences and institutional regulations than by the student's own desires and inclinations. As a result, many students enter programs for which they are inadequately prepared, leading to reduced motivation, lower performance, and difficulties in aligning their studies with future career aspirations.

Effective guidance does not imply granting students unrestricted freedom of choice. Rather, it involves structured, individualized support from qualified academic advisors who assist students in analyzing their educational and professional challenges in light of their personal strengths and competencies. This support helps students identify pathways that best match their potential, ultimately enabling them to become productive citizens who derive satisfaction and well-being from their chosen careers.

Mustafa Ghaleb underscores that the educational advisor must help students evaluate their mental and physical aptitudes, academic and professional interests, and the available educational resources, then guide them toward institutions and programs that align with their goals.

A core element of academic advising in kinesiology and physical education is the assessment of students' prior academic background, particularly the secondary school stream (literary, scientific, or technical). University programs in this field typically require a solid foundation in biology, physics, chemistry, and mathematics. Additionally, subjects such as psychology, sociology, and philosophy provide valuable preparation for the socio-humanistic components of physical education curricula.

Al-Khouli (2002, p. 236) observes that the question of which secondary school stream best prepares students for success in physical education teacher training remains unresolved. Consequently, most physical education institutes in Algeria accept applicants from various streams, placing primary emphasis on the overall baccalaureate score rather than the specific track. Kerfes (2015) supported this approach in a comparative study that found no statistically significant differences in training performance based on students' secondary school backgrounds. While prior academic stream does not appear to constitute a major barrier, it may influence the level of initial readiness for the program.

Nevertheless, recent studies indicate that students with lower baccalaureate scores are disproportionately represented in physical education programs. Many appear to view these institutes as an easier route to obtaining a university degree when ad-

mission to more competitive programs proves difficult (Al-Khouli, 2002, p. 237; Alem et al., 2013).

To ensure objective and reliable student selection, it is essential to employ scientifically validated assessment tools and entrance examinations. These instruments provide a systematic means of identifying candidates who possess the cognitive, physical, motor, emotional, and affective aptitudes required for excellence in the field.

Furthermore, information dissemination through various media channels serves as an effective tool for shaping students' attitudes and expectations regarding university studies and future careers in sports. Media can familiarize prospective students with the unique characteristics of physical education programs and the realities of the profession.

Guidance is fundamentally an educational process that assists students in making informed choices aligned with their abilities and preferences. Such informed decision-making is a critical determinant of both academic success and long-term professional satisfaction.

The debate concerning the most suitable secondary school stream for physical education training persists. While the current flexible admission policy does not appear to prevent students from completing their studies, it may result in incomplete preparation in certain foundational areas. Future research should therefore investigate the long-term effects of different secondary streams on academic and professional outcomes, especially in light of ongoing educational reforms in Algeria.

Previous practical experience in sports is widely recognized as beneficial for future physical education instructors. Studies consistently show that individuals with prior sports engagement develop personal and professional attributes - such as discipline, teamwork, resilience, and practical skills - that distinguish them from those without such experience.

Academic Advising Models in Higher Education Two principal models of academic advising prevail in higher education. The Prescriptive Advising Model is directive and information-focused, emphasizing course selection, rule compliance, and administrative support. In contrast, the Developmental Advising Model adopts a holistic, student-centered approach that fosters self-awareness, decision-making skills, and long-term personal and professional growth (Crookston, 1972).

In the Algerian context, the classical university system tends toward a more prescriptive model, with advising often limited to routine administrative tasks. The LMD

system, however, promotes a developmental approach by assigning supervising professors a mentoring role that provides continuous academic, psychological, and career support. This shift facilitates better alignment between student aspirations and labor-market demands, as evidenced by comparative studies in the Maghreb region (Kerfes & Cloes, 2015). Recent Algerian and regional research confirms that the LMD framework enhances student adaptation and reduces dropout risks compared to the classical system, particularly in applied fields such as physical education and sports sciences.

In summary, academic guidance in kinesiology and physical education must integrate all the above elements. It requires scientifically grounded procedures, continuous and systematic mentoring throughout the university period, and the creation of supportive conditions through encouragement, motivation, and the cultivation of positive attitudes. These measures are essential for producing highly qualified professionals who can serve society effectively while minimizing the risk of future attrition from the teaching profession.

Methods

Research Design

The study adopted a descriptive research design, as it is the most suitable approach for investigating perceptions and comparing two higher education systems in the field of kinesiology and physical education.

Study Population

The target population consisted of key stakeholders involved in higher education training in kinesiology and physical education at the University of Algiers., including faculty members, current students (particularly those nearing graduation), and graduates from both the classical system and the LMD (Licence-Master-Doctorate) system.

Sample The study sample consisted of 202 respondents, distributed as follows:

- 28 faculty members
- 77 students nearing graduation
- 97 graduates

This sample included participants from both the classical and LMD systems. The sampling procedure was based on convenience (non-probability) sampling, targeting readily accessible and willing participants within the university community. Although

the sample size is reasonable for exploratory research, its representativeness remains limited due to the non-random selection method.

Characteristics of the Study Sample

Table 1. Distribution of the Sample by Role and University System

Role	Classical System	LMD System	Total	Percentage (%)
Faculty Members	12	16	28	13.9
Students (nearing graduation)	35	42	77	38.1
Graduates	48	49	97	48.0
Total	**95**	**107**	**202**	**100**

Questionnaire Description

The questionnaire was developed specifically for this study and consisted of 28 items divided into four main sections:

1. Demographic Information (6 items)
2. Perceived Importance of Academic Advising (8 items) - using a 5-point Likert scale
3. Procedures and Practices of Academic Guidance (8 items)
4. Comparison between Classical and LMD Systems + Open-ended Questions (6 items)

Sample Questions:

- "Academic advising plays a crucial role in helping students adapt to university life and achieve academic success." (Likert scale)
- "How often do you meet with your academic advisor during one semester?" (Multiple choice)
- "What are the main obstacles facing effective academic advising in your university system? Please explain." (Open-ended)

Validity and Reliability of the Questionnaire

The questionnaire was validated through a two-stage process. First, face and content validity were ensured by submitting the initial draft to a panel of five experts in sports management and higher education. Necessary modifications were made based on their feedback. Second, a pilot study was conducted with 25 participants (not included in the final sample). Internal consistency for the Likert-scale sections was acceptable (ranging from 0.78 to 0.86).

Data Processing and Statistical Analysis

Responses to closed-ended questions were coded and entered into Microsoft Excel, then analyzed using Statistica and SPSS. Descriptive statistics (frequencies and percentages) were calculated. Inferential statistics included the Chi-square test for categorical variables and independent-samples t-tests to compare mean responses between the classical and LMD systems. When normality assumptions were not satisfied, the Mann-Whitney U test was applied. Differences were considered statistically significant at $p \leq 0.05$.

For open-ended questions, responses were subjected to qualitative content analysis through systematic coding.

Ethical Considerations

This study was conducted in accordance with ethical principles for research involving human participants. Approval was obtained from the relevant university research committee. All participants were informed about the purpose of the study and provided informed consent. Participation was voluntary, and confidentiality and anonymity were strictly maintained.

Verification of Analysis Reliability

Intra-rater reliability was assessed by having the researcher code the same open-ended responses at two different time points. The percentage of agreement was calculated using the formula:

$$\text{Agreement (\%)} = \frac{\text{Number of agreements}}{\text{Number of agreements} + \text{Number of disagreements}} \times 100$$

The agreement rate exceeded 85% across all analyses, confirming the stability of the coding process.

Results

Academic Advising and Its Role in University Success

Table 2. Students' Perceptions of the Importance of Academic Advising in Achieving the Objectives of Physical Education Teacher Training (Percentages of "Agree" and "Strongly Agree" Responses)

Item Description	Classical (%)	LMD (%)	p-value
Acquisition of professional competencies	90.3	88.3	0.76
Broadening theoretical and academic knowledge	90.3	84.4	0.42
Reaching a defined level of practical performance	74.2	85.7	0.15
Achieving a defined level of guidance/mentoring	80.6	85.7	0.51
Acquisition of motor/physical skills	87.1	64.9	0.02*
Acquisition of pedagogical competencies	90.3	84.4	0.42
Acquisition of relational competencies	87.1	79.2	0.34
Acquisition of scientific competencies	54.8	85.7	0.001**

$p < 0.05$; ** $p < 0.01$

A high percentage of students from both training systems rated all proposed items as highly important. The only statistically significant difference appeared in "acquisition of motor/physical skills," where students in the classical system assigned significantly higher importance. In contrast, students in the LMD system placed significantly greater importance on "acquisition of scientific competencies." These differences suggest that the two systems shape students' expectations differently, highlighting the potential role of academic advisors in bridging these expectations.

Students' Motivations for Choosing Physical Education Training and Their Relationship to the Labor Market

Table 3. Motivations for Enrolling in Physical Education Programs According to Faculty Members (Percentages of "Agree" and "Strongly Agree")

Item Description	Classical (%)	LMD (%)	p-value
Desire to work in physical and sports education	91.7	92.9	0.89
Obtaining a degree that ensures a stable career	83.3	92.9	0.35
Positive perception of sports-related professions	66.7	67.9	0.94
Love of sport	91.7	92.9	0.90
Preference for working outdoors	33.3	46.4	0.44
Desire to actively practice sports	100	71.4	0.03*
Seeking an easy course of study	33.3	28.6	0.76
Ease of employment in the field	16.7	50.0	0.049*
Ability to maintain physical fitness	33.3	21.4	0.42

$p < 0.05$

Faculty members identified "love of sport" and "desire to work in physical and sports education" as the strongest motivations. Significant differences emerged regarding "desire to actively practice sports" (higher in classical) and "ease of employment" (higher in LMD).

The Role of Academic Advising in Introducing Students to Various Career Paths

Table 4. Preferred Career Paths Upon Enrollment in Physical Education Programs (Percentages of Agreement by Group)

Career Path	Faculty Classical	Faculty LMD	Students Classical	Students LMD	Graduates Classical	Graduates LMD
Education	91.7	96.4	90.3	94.8	86.7	94.8
Training/Coaching	75.0	96.4*	83.9	83.1	84.4	85.6
Recreation/Leisure	41.7	42.9	51.6*	23.4	60.0*	23.7
Sports Administration & Management	0	17.9	51.6*	29.9	28.9	30.9

Indicates statistically significant differences ($p < 0.05$)

"Education" remained the most preferred career path across all groups, followed by "training/coaching." The LMD system showed stronger orientation toward coaching and sports management.

Discussion

The results demonstrate a broad consensus among faculty members, students, and graduates on the critical importance of academic advising in university training within the sports field. Both the classical and LMD systems recognize its contribution to developing professional, pedagogical, scientific, and motor competencies. However, distinct differences emerge in emphasis: the classical system prioritizes motor and practical skills, while the LMD system places greater weight on scientific competencies and awareness of diverse career paths.

These findings align closely with recent international research in sport management and higher education policy. A 2024 comprehensive review emphasizes that developmental advising models significantly enhance student belonging, retention, and career readiness - particularly in applied fields such as kinesiology and sport management. Similarly, studies applying Learned Needs Theory show that effective academic advising helps students balance demands and improve persistence rates.

In the Algerian context, the observed differences between the two systems reflect well-documented challenges of the LMD reform. While the LMD system promotes

professionalization and flexibility, implementation gaps remain in practical fields like physical education. Our results corroborate that the LMD system is more effective in broadening career awareness.

Regarding motivations and employability, the dominant role of "love of sport" alongside growing awareness of employment prospects echoes recent studies on student-athlete success and retention activities. Targeted academic advising is essential for bridging the gap between student aspirations and labor-market realities.

Overall, while both systems demonstrate strengths, the results underscore the necessity of strengthening academic advising structures - particularly in the classical system - to better align with modern higher education policies that emphasize employability, student belonging, and professional diversification in sport management. Academic advising is no longer merely administrative support but a strategic tool for enhancing graduate outcomes in an evolving labor market.

Conclusion

This study examined the role of academic advising in university training systems in the field of physical education and sports by comparing perceptions across the classical and LMD systems. The findings indicate a strong consensus among faculty members, students, and graduates regarding the importance of academic advising in supporting students' academic success and professional development.

While both systems demonstrate strengths, notable differences were observed in the types of competencies emphasized. The classical system appears to prioritize practical and motor skills, whereas the LMD system places greater emphasis on scientific competencies and awareness of diverse career opportunities. These differences highlight the importance of structured academic advising in helping students navigate educational pathways and align their aspirations with labor-market realities.

The study suggests that strengthening academic advising mechanisms within sports education programs could significantly enhance students' professional orientation, career preparedness, and integration into the labor market. Universities should therefore consider institutionalizing structured advising systems, improving advisor training, and integrating career guidance into the curriculum.

Future research should expand the sample to include multiple universities and employ longitudinal designs to better understand the long-term impact of academic advising on graduates' professional trajectories.-

Limitations

This study has several limitations. The sample was drawn exclusively from one institution (the University of Algiers) using convenience sampling, which limits generalizability. The research relied primarily on self-reported perceptions, which may be subject to social desirability bias. The cross-sectional design does not allow longitudinal tracking of advising effects. Finally, while the questionnaire underwent basic validity checks, more advanced psychometric validation could strengthen future work. Despite these constraints, the study provides valuable insights and a foundation for larger-scale research.

Practical Implications

The findings of this study provide useful insights for higher education policymakers and university administrators. Strengthening academic advising structures within sports education programs could improve students' career orientation and better align university training with labor-market needs. Establishing formal advising units and providing professional training for academic advisors may contribute to improving student retention and graduate employability.

Conflict of interests:

The authors declare no conflict of interest.

Author Contributions

Conceptualization, A.N. and N.K.; Resources, A.N. and S.E.L.; Methodology, A.N.; Investigation, A.N. and S.E.L.; Data curation, A.N.; Formal Analysis, A.N. and N.K.; Writing – original draft, A.N.; Writing – review & editing, N.K. and S.E.L.; Supervision, N.K.

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DIGITAL PLATFORMS AND ARTIFICIAL INTELLIGENCE IN SPORTS MARKETING: BOOSTING CUSTOMER INTERACTION AND PERSONALIZATION

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Abstract: Digital platforms and artificial intelligence (AI) are increasingly shaping sports marketing through machine learning, predictive analytics, and automated content generation. Although these technological innovations introduce substantial changes across the sports industry, they simultaneously raise complex ethical and regulatory challenges. This paper critically examines the interplay between digital platforms and AI tools from the athlete's perspective, focusing on the personalization of communications and interactive engagement with key stakeholder groups, including fans, sponsors, and other relevant publics. Using a narrative literature review approach, the study synthesizes recent scholarship on the implementation of digitalization and AI in sports marketing. In parallel, it explores contemporary marketing practices athletes employ when addressing external audiences, with particular emphasis on personalization and interactivity. The paper concludes by offering guidelines for implementing innovative technologies in sports marketing, supporting a more transparent and responsible use of AI within the sports domain.

Keywords: artificial intelligence, athletes, customer interaction, personalization, ethics in sports marketing

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Introduction

Over the past decades, the sports industry has experienced sustained growth in both market size and revenue, alongside expanding media exposure and global influence. Professional sport increasingly operates as a complex business ecosystem connecting clubs, leagues, sponsors, media organizations, technology firms, and fans, where decisions are informed by strategic planning, analytics, and resource management. In such an environment, the demand for efficiency, process optimization, and value creation becomes critical - particularly in the context of intensifying competition, shifts in consumer behaviour, and rapid technological advancement.

Against this backdrop, artificial intelligence (AI), as one of the most dynamic contemporary technologies - supported by digital platforms - has assumed an increasingly prominent role across industries, including sport AI is leveraged to enhance operational efficiency and data-driven decision-making by enabling the rapid processing of large-scale information, pattern recognition, and the generation of forecasts that can be decisive for business performance. In the sporting context, AI is increasingly applied in areas such as operations management, event planning and logistics, marketing and communications, and the development of new models of fan engagement (Karimi et al., 2025).

Artificial intelligence is increasingly becoming a key intermediary in the way athletes communicate with their target audiences in marketing terms, as it enables a systematic understanding of audiences, the tailoring of messages, and the scaling of communication across digital platforms. The starting point of this transformation lies in the ability to extract insights into fans' preferences and motivations from large volumes of audience-behaviour data - views, comments, shares, attention retention, purchasing patterns, and reactions to different content formats. In this way, supported by AI analytics, athletes move from intuitive "content posting" to datadriven communication in which themes, narratives, and visual codes that generate engagement and strengthen perceptions of authenticity are identified (Glebova, 2024).

A particularly notable impact of AI concerns the relationship between athletes and audiences. Digital platforms, social media, and personalized content have become dominant communication channels, while fan expectations continue to rise as audiences seek faster access to information, greater interactivity, more personalized experiences, and a stronger sense of closeness to a club or athlete (Du et al., 2023).

Ai enables precisely such approaches through content recommendation systems, automated communication (e.g., chatbots), audience segmentation, and predictive analytics that support a deeper understanding of fan behaviour.

The aim of this review paper is to examine the role and implementation of diverse digital platforms and AI tools that support athlete branding, as well as the marketing communications athletes develop through personalization and interactivity with their target publics.

Literature Review

In the digital era, it is evident that sport and sports content production are undergoing a highly visible transformation. In the past, athletes were often positioned in the shadow of clubs and sport federations, whereas today their individual affirmation through personal branding is increasingly common. These developments are enabled by the latest technological trends (Doyle et al., 2023) grounded in digital platforms and artificial intelligence (AI). As a result, the contemporary athlete is increasingly bypassing traditional intermediaries and focusing on self-directed branding and content production (Stegmann et al., 2023).

The implementation of AI tools in the sports industry directly affects management practices, athletes' activities, and the broader commercialization of sport. Content is now produced in increasingly automated ways, while fans are algorithmically segmented and personalized, which further supports athlete autonomy. Due to the growing penetration of modern technologies (Dašić & Jeličić, 2016), content production costs have decreased and opportunities for personalized fan engagement have expanded across a wider range of channels.

At the same time, these developments raise critical questions regarding ethics and regulatory frameworks in AI-driven sport (Napoli, 2017). Specifically, campaign personalization via social media and the deployment of AI frequently rely on the use of personal data, thereby intensifying concerns related to privacy and data protection (Karimi et al., 2025). In this regard, the literature underscores the importance of consistent transparency in data collection and processing, as well as ensuring algorithmic fairness within advertising and promotional systems.

From local competitions to professional leagues, the sports industry occupies an exceptionally important position within the global media landscape. When sport is successfully and consistently distributed through media channels, it generates billions of dollars in revenue and confirms its status as a continuously expanding market. Recent research highlights the significance of AI implementation for athlete value co-creation. Supported by AI tools, sports content - including live broadcasts - is increasingly produced in innovative ways, while new opportunities emerge for

athlete branding and self-production using digital platforms (Ilievska Kostadinović & Kostadinović, 2025).

Athlete marketing supported by social media and AI has become an indispensable component of sports marketing, given that athletes are central to both the sports industry and its marketplace (Sotiriadou et al., 2024). Through the strategic development of an athlete's brand, a distinctive identity is created, strengthening the athlete's position in the sports market and increasing their market value and influence within sport and beyond (Arai et al., 2023).

By leveraging social media and AI for branding, athletes can shape public perceptions and trends, thereby becoming role models for many audiences. Moreover, strategic athlete marketing is increasingly intertwined with digital identity, commercial partnerships (Dašić et al., 2021), and broader social influence. In this context, examining these dynamics contributes to a more nuanced understanding of sports marketing (Taniyev & Gordon, 2022). The intersection of AI and athlete branding opens new possibilities for transforming how audiences consume sports content, and this potential is becoming increasingly pronounced as technology continues to evolve.

Digital Platforms as Support for Marketing Communications in Sport

In today's digital environment, audiences demand more than traditional advertising; they seek personalized, immersive experiences that emotionally engage them and connect them with their favourite athletes, teams, and brands at a deeper level.

Digital platforms have expanded athletes' capacity to act as direct communicators, enabling them to reach global audiences through a range of digital formats. In this way, athletes' visibility is amplified most immediately, their results and achievements are continuously quantified and displayed, and their influence is publicly enacted. These personalized experiences are then translated across multiple platforms, strengthening emotional bond - most notably with fans, but also with potential sponsors - while fostering long-term loyalty. In this context, YouTube is commonly used to showcase interactive sporting moments through more in-depth video content; Instagram and TikTok compete through virality and visually driven formats that particularly resonate with younger audiences; and Twitch is primarily leveraged for more immediate, real-time communication between athletes and their audiences.

The widespread adoption of digital media has enabled athletes to share their experiences and communications not only with fans, but also with sports organisations, media outlets, and prospective sponsors, marking a new era of marketing communication

in sport. Social media has made it possible for audiences to monitor athletes' activities continuously and for athletes to disseminate information directly to their target publics. In practice, certain sports platforms employ artificial intelligence to generate short video reports that athletes can download and share with their followers. These outputs may include match analysis, forecasts, and statistical insights that have been pre-processed and interpreted in advance. Such formats are particularly relevant for social media, which requires consistently dynamic content and sustained interaction with audiences.

Notably, athlete engagement metrics on social media have become highly important in sponsor communication and are often considered as influential as on-field performance (Brison & Geurin, 2021). This suggests that athletes who communicate more directly with their audiences - through regular social media posting and practices perceived as highly authentic - are typically valued more highly by sponsors. Empirical evidence (Nichols & Shapiro, 2023) further indicates that both audiences and sponsors tend to favour athletes who cultivate digital authenticity, as this perceived closeness facilitates stronger emotional attachment and a more genuine shared experience of athletic outcomes.

Social media platforms function as digitised environments in which athletes - ranging from amateurs to professionals - construct their public image daily. Across sporting communities, it is increasingly observable how athletes shape digital communication with diverse target publics, build recognition, and thereby unlock various forms of partnership and collaboration, a phenomenon often described as "micro-influencerism" (Du et al., 2023).

At the same time, there are potential adverse effects for athletes. Excessive engagement on social media may entail mental-health consequences, as continuous activity and visibility can blur boundaries between private life and constant surveillance (Qi et al., 2024).

The digital transformation of athlete communication with target publics, especially the shift from traditional channels to digital and online platforms has further accelerated the adoption of artificial intelligence. Real-time audience behaviour analysis, forecasting viewer interests, and personalising multimedia content enable sports media organisations to offer more relevant and interactive experiences. In this way, AI becomes a key factor in increasing viewership, improving advertising models, and securing stable revenue streams.

As AI becomes increasingly embedded in the sports industry, it is also optimising numerous dimensions of sports management. With respect to athlete support, beyond its role in analysing physical and physiological performance, AI tools enable athletes to monitor relationships with fans and other stakeholder groups and to manage their communications and interactions with audiences more effectively (Schut & Glebova, 2022).

Implementation of Artificial Intelligence in Sports Marketing

Through advances in machine learning and natural language processing (Trango-Tech, 2018), AI enables athletes to develop brand-driven experiences that are highly relevant to the fast-paced and dynamic world of sport. Historically, sports advertising relied predominantly on mass-market messages directed at broad audiences, and it was often nearly impossible for individual athletes to engage in one-to-one communication with their target publics. Today, however, the capacity to analyse fan data - ranging from viewing habits and social media interactions to purchasing behaviour and sentiment analysis - allows elite athletes who have established their personal brands to deliver targeted campaigns that resonate more directly and meaningfully with their audiences.

In this context, it has become increasingly common for athletes to offer "authentic" engagement while using AI to optimise and automate content production (Breves et al., 2019). The primary advantages of generative AI tools lie in lower content production costs, whereas key limitations relate to insufficient analytics and the risk of overly automated, formulaic text, which can reduce the perceived human quality of athlete-audience relationships (Carlson, 2015).

AI algorithms process vast quantities of data about athletes and their teams - ran-ging from immediate in-game performance to attributes associated with physical endurance and readiness for competition. These data are subsequently translated into visual representations that facilitate audience understanding of the game. Notably, AI is also widely applied in predictive analytics: based on prior performances and an athlete's current form, algorithms can generate forecasts regarding prospective match outcomes in which a favourite athlete may participate (Boyle, 2017).

At the same time, AI enables greater creativity and more efficient design of promotional activities in sports marketing. By leveraging AI-driven tools, athletes can structure diverse interactions with multiple stakeholder groups - rom fans to potential sponsors – connecting them in more distinctive and contextually tailored ways. This supports the development of experiential narratives with targeted audiences that go well beyond the impact of conventional advertising. Through AI-enabled communication, an intensified sense of proximity and belonging can be cultivated among fans, thereby generating higher levels of engagement and interaction with favourite athletes. Illustratively, fans may create personalised avatars through which they can compete in virtual games with legendary athlete-players. In this manner, the fan is no longer merely a passive spectator but becomes an active participant in a broader meta-narrative and experience (Leitte, 2022).

AI tools can also support elite athletes by predicting which matches are likely to attract the highest attendance or identifying which souvenirs - bearing an athlete's image or sig-

nature - are expected to be most in demand among geographically or behaviourally segmented consumer groups (Crabtree & Zhang, 2022). Moreover, athletes - whether amateur or professional - can deploy AI-powered chatbots to provide fans with personalised responses to inquiries, typically related to match schedules, ticket availability, or merchandise. Finally, as AI becomes more embedded in the sports industry, athletes can analyse digitally mediated audience communications more effectively and use these insights to further refine their marketing strategies (Glebova, 2024).

AI also plays a significant role in generating match-related or other sports content featuring particular athletes. Using machine learning techniques, athletes can select key moments they wish to share with their target audiences and communicate through the creation of customised highlight packages (Patel & Kumar, 2022). Nevertheless, caution is warranted when employing such AI tools (Popović Šević et al., 2025), given potential technical limitations that may affect the accuracy and reliability of outputs.

AI enables advanced audience segmentation and more precise definition of target groups. Rather than treating communication as homogeneous, algorithms can differentiate fans by interests (e.g., training, lifestyle, competitive content, fashion), location, language, level of engagement, and likelihood of conversion (e.g., purchasing tickets or products). This provides the basis for personalisation, namely directing different messages and offers to different segments. In this way, an athlete can simultaneously build emotional closeness through "behind-the-scenes" content, authority through educational training advice, and commercial value through targeted merchandising or sponsored campaigns - where personalisation is grounded in relevance rather than excessive frequency or aggressive targeting (Arai et al., 2023).

Beyond strategic targeting, AI also significantly affects the operational side of communication by accelerating and enhancing content production. Generative models are used to develop ideas, shape narratives, write captions and descriptions, adapt creative messages to different platforms and contexts, and localise content into multiple languages. This increases the consistency of an athlete's brand identity across channels while reducing the costs and time required for content creation. In practice, it enables faster responses to trends and current sporting events, as well as longer-term planning of content series that strengthen the athlete's recognisability and value positioning.

Within the broader AI ecosystem - including algorithms, machine learning, and cloud computing - data required for sports marketing are extracted, processed, and operationalised. Given the extent to which advanced technologies are reshaping contemporary realities, AI in sport stands out as a particularly transformative instrument among emerging technologies (Li & Huang, 2023).

AI-based tools - such as audience sentiment analysis systems, automated sports news generation, and intelligent recommender systems - contribute to higher engagement and improved user retention. These applications range from strictly structured, factual reporting to more complex analytical summaries.

User Interactivity and Personalization in Athlete Communication

The use of AI in sports marketing supports enhanced service personalization and increases user engagement (Rane, 2023). Through big data analytics and advanced algorithms, behavioural patterns can be identified across key target groups, including fans, broader audiences, potential sponsors, marketers, sports professionals, and other stakeholder categories. The development of sophisticated algorithms, the availability of large-scale data, and the growing demand for fast, personalized, and interactive content have collectively driven the expanding use of AI in the production and distribution of content that athletes deliver to their target publics (Linsner et al., 2020).

Content personalization represents one of the most significant applications of AI within athlete branding processes, as it enables content to be tailored to specific audiences. These systems rely on audience behavioural data - such as clicks, dwell time, and prior interactions - to increase engagement and extend the time fans spend on athletes' digital platforms (Lewis & Westlund, 2015).

Personalization is also applied within mobile applications of sports clubs in which a given athlete is featured. For example, an application may send push notifications exclusively for matches involving the club of a fan's preferred athlete or display only information relevant to that athlete. Moreover, within match broadcasts, personalization can allow users to independently select the channels, statistics, or graphics they wish to view (Kunkel et al., 2019).

Using AI algorithms, tools can analyse user behaviour and preferences across the sports ecosystem with the aim of creating personalized experiences (Gao & Liu, 2023). From a technological standpoint, personalization may also be defined as the adaptation of sports-related products and services through information derived from user behaviour and from transactions previously conducted within sport-related activities (Montgomery & Smith, 2009).

At the same time, AI-driven digital platforms are increasingly central to athlete success and to the quality of athlete-audience interaction. AI provides substantial support for customer relationship management (CRM). Within sports marketing, AI helps athletes strengthen relationships with fans, sponsors, and other stakeholder

groups in the external environment (Pashaie et al., 2024). Whether independently or in collaboration with marketing specialists, athletes are continuously informed about relevant developments and the application of AI-enabled CRM tools. This is important for timely selection and implementation of the most effective CRM elements for managing relationships with target publics. The outcome is a more engaged and loyal audience base for a given athlete. Building on personalization, AI in sports marketing thus contributes to the strengthening of long-term relationships with users of sports-related services.

Conclusion

The adoption of AI tools is accelerating at an exceptional pace in sports marketing and across the sports industry more broadly. AI stimulates innovation in product and service development by enabling personalized fan-engagement platforms and immersive experiences, such as virtual reality applications. This paper has demonstrated the extent to which AI represents a powerful instrument for selecting and analysing user data in sport - whether for the personalization of user experiences or for enhancing interactions between a high-profile athlete and their target audiences. The findings further indicate that personalized user experiences constitute a critical foundation for designing effective interactions with an athlete's key target groups. In addition, the paper provided an overview of market penetration in sport enabled by precise targeting through AI-based digital platforms. AI's role in personalizing stakeholder experiences in sport emerges as another central strategy, as it facilitates deeper user engagement through predictive analytics and machine learning algorithms.

Through high-quality customer relationship management (CRM) in sport, organisations can build databases that subsequently support personalization and improve the effectiveness of marketing communication and interaction. Based on such personalization and audience interaction, athletes can more readily develop marketing and other forms of communication, as they have access to behavioural data that can be leveraged to further strengthen engagement and loyalty.

AI's contribution is also reflected in the professionalisation of brand relationships and monetisation. By using predictive models and engagement indicators, it becomes possible to assess the alignment between an athlete's identity and a sponsor's values, as well as the potential effectiveness of campaigns across different audience segments. This allows athletes to make more informed partnership decisions, measure actual return on investment, and develop sustainable monetisation models grounded in long-term fan loyalty rather than relying solely on short-term reach.

However, this transformation simultaneously raises important ethical and governance issues. Personalisation and automation carry risks related to privacy infringement, non-transparent targeting, and the erosion of authenticity - especially when AI is used to simulate an athlete's "personal voice" without clear oversight and accountability. Therefore, the responsible use of artificial intelligence in sports marketing must rest on clear data-protection standards, transparency in sponsored content, human supervision, and the strategic preservation of reputational capital. Within this framework, AI should be seen not as a substitute for the athlete, but as a socio-technical tool that, when properly governed, enhances the relevance of communication, deepens audience relationships, and increases the market value of the sports brand. To deliver enhanced personalization, appropriate audience interaction, and operational efficiency, it is essential for athletes to cultivate a culture of continuous adaptability and learning in their communications. Only in this way can a sustainable future for the sports industry be fostered.

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ORGANIZATIONAL AND MANAGERIAL CHALLENGES OF SPORTS AND MEDIA ORGANIZATIONS UNDER CONDITIONS OF DIGITAL TRANSFORMATION AND MARKET INNOVATION

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Abstract: This paper examines digital transformation in sports and media organizations as a complex process that extends beyond technological adoption to include organizational and managerial change. The study is based on a conceptual review of contemporary literature from the fields of sport management, media studies, and information systems. The findings indicate that successful digital transformation depends on the development of dynamic capabilities, cross-functional integration, and effective data governance. At the same time, increasing reliance on digital platforms and artificial intelligence introduces new challenges related to control, transparency, and trust. The paper contributes to the literature by proposing a conceptual framework that integrates organizational, technological, and managerial dimensions of digital transformation in sports and media contexts. The results suggest that sustainable transformation requires balancing innovation with governance, as well as technological advancement with ethical responsibility and stakeholder trust.

Keywords: digital transformation; sports and media organizations; dynamic capabilities; business model innovation; platformization

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Introduction

One of the most important structural forces influencing modern sports and media businesses is digital transformation. The creation, distribution, and monetization of sports material, as well as the ways in which viewers, sponsors, and the larger market interact, are all significantly changed by the advancement of digital technologies, platforms, and analytical tools. Networked, platform-based, and data-driven business models are gradually replacing old models based on mass broadcasting and linear value chains in professional sports and sports media, creating new organizational and managerial needs (Zheng & Mason, 2022).

Contemporary literature emphasizes that digital transformation in sport is not merely a technical process, but a profound organizational change requiring adjustments in structures, processes, and governance practices (Anđelić et al., 2017). Technological innovations affect multiple dimensions of sports organizations, including operational efficiency, data-driven decision-making, athlete performance management, and the development of new forms of fan engagement (Dasic, 2018; Ratten, 2020). However, the ability of organizations to convert these technologies into sustainable market innovations depends on managerial competencies, organizational culture, and capacities for learning and adaptation (Kostadinović, Ilievska Kostadinović, 2025). Recent studies further highlight that the growing use of generative AI in sports journalism raises important questions related to transparency, credibility, and audience trust. Empirical evidence suggests that the presence of clear AI ethics policies and disclosure practices significantly influences how audiences perceive the trustworthiness and value of AI-generated sports content (Waddell, 2026).

The main obstacles to digital transformation in sports companies, according to empirical study, frequently arise at the administrative and organizational levels rather than at the level of technology accessibility. Significant obstacles to the effective execution of digital initiatives include a lack of digital competences, employee resistance to change, dispersed responsibilities, and challenges in calculating return on investment. (Qi et al., 2024). These challenges are further complicated by the need to preserve sporting integrity, ethical standards, and long-term organizational reputation in conditions of intensive digital data exploitation.

In the context of sports media, digital transformation significantly affects work organization, professional roles, and content management. Digital platforms and social media are reshaping the logic of sports journalism and production, imposing demands for faster content creation, multi-platform approaches, and continuous interaction with audiences (Hamadi, 2025). Such an environment increases pressure on

management to develop flexible organizational models that enable coordination among editorial, technological, and marketing functions while maintaining professional standards and content quality (Kroon & Eriksson, 2019).

Finally, contemporary studies increasingly link digital transformation to issues of competitiveness and sustainability in sports organizations. Although digital innovations may enhance performance and market positioning, their positive effects are not automatic; they depend on management's ability to integrate digital resources into organizational strategy, structure, and processes (Wang et al., 2024). For this reason, understanding organizational and managerial challenges under conditions of digital transformation and market innovation represents a crucial starting point for analyzing the contemporary development of sports and media organizations (Kostadinović & Ilievska Kostadinović, 2025).

Literature Review

The digital transformation of sports and media organizations is increasingly recognized in modern scholarship as a multifaceted organizational change that necessitates resource recombination, process redesign, data governance, and reevaluation of relationships with audiences and markets rather than as a singular "IT modernization." One branch of sport management research treats digital technologies as catalysts for change in learning, coordination, and decision-making, emphasizing the development of organizational skills through data analytics and technological tools.. Empirical evidence from elite sport suggests that analytics and advanced technologies can foster learning organization capabilities and enhance performance (Lunić & Ćesarević, 2025), while simultaneously raising managerial dilemmas regarding the integration of analytics teams, process standardization, and the transformation of data into operational knowledge (Olaniyan et al., 2024). Within the dynamic capabilities perspective, recent studies argue that digital environments increase turbulence and exposure to shocks, making resilience contingent upon management's ability to reconfigure routines, reallocate resources, and accelerate learning during crises. Research from the COVID-19 period highlights capability building as a central leadership task in sports organizations (Marques et al., 2025). These findings imply that a key organizational challenge lies in establishing governance mechanisms for digital transformation, encompassing digital strategy formulation, data ownership, accountability for change, and cross-functional coordination (Trkulja et al., 2025).

A different corpus of research looks at digitalization across a wider range of sports organizations, such as local and volunteer clubs that function with few resources and a variety of skill sets. Typologies of digitalization practices in voluntary sports clubs show differences in managerial mindsets, which result in unequal capacities for innovation and adaptation, as well as in the degree and intent of digital tool adoption, ranging from marketing and membership management to administration and communication. (Ehnold et al., 2023). These findings shift the analytical focus from technology itself to managerial capacity, including knowledge availability, readiness for change, process formalization, and the ability to translate external digital trends into organizationally relevant routines.

Digital transformation is seen in the media and sports media markets as a reconfiguration of industry boundaries through OTT platforms, streaming services, and platform rivalry rather than just a move to new channels. Based on niche theory and uses-and-gratifications approaches, studies comparing traditional television and video-OTT services show that while traditional television still has advantages in terms of information provision and perceived financial value, users are increasingly valuing OTT services for convenience, relaxation, and flexibility. Media companies are under pressure to reevaluate their value propositions and monetization strategies as a result of the increased market competition. (Papathanasopoulos & Varoutas, 2024). Simultaneously, the growth of synchronous digital formats such as social live streaming reshapes sports content production and consumption. Research on co-streaming platforms such as Twitch demonstrates that virtual interactions enhance value co-creation experiences and platform involvement, indirectly increasing viewing intentions; consequently, managerial challenges revolve around designing interactive ecosystems and managing relationships with platform communities (Qian & Seifried, 2023). Organizational attention thus shifts from linear broadcasting to orchestrating networks of actors - platforms, creators, audiences, and brands – requiring new competencies in community management, partnerships, and user data analytics. In addition, recent research emphasizes the importance of adopting a broader ecosystem perspective when analyzing digital transformation in sports contexts. Rather than focusing solely on individual organizations, digital transformation should be understood as a process shaped by interactions among multiple stakeholders, including media organizations, technology providers, platforms, and audiences (Haffner et al., 2025).

Digital transformation further amplifies the role of social media, algorithmic distribution, and culturally aligned content strategies. Analyses of sports fan engagement suggest that culturally aligned content characteristics, such as language expectations, can predict engagement levels on social media, implying the need for more

sophisticated marketing analytics and localized communication strategies (Prakash & Majumdar, 2023). However, the expansion of digital sports content consumption and fragmentation of information sources also alter media usage patterns. Research on alternative online sources for sports event consumption, grounded in TAM and uses-and-gratifications frameworks, indicates a shift in audience preferences toward digital channels, compelling organizations to balance technological accessibility, credibility, user experience, and business model sustainability in competitive environments (Hamidou & Amara, 2024).

A particularly dynamic domain concerns digital innovation through Web3 technologies and tokenization. Studies on fan tokens suggest that token-based digital platforms may influence team identification and co-creation mechanisms, with the meanings attributed to tokens mediating the relationship between technology use and behavioral intentions (Vollero et al., 2024). More broadly, research on blockchain in the sports industry highlights the potential for business model transformation and innovation performance improvements among firms adopting blockchain concepts, while also noting institutional barriers, standardization challenges, and measurement limitations (Lv et al., 2022). Managerial challenges therefore extend to regulatory and reputational risk management, the design of sustainable value propositions beyond short-term speculation, and the integration of new digital products into established relationships with fans and sponsors.

Digital transformation in media organizations, particularly in sports journalism, introduces additional layers of complexity related to automation, generative AI, and credibility concerns (Lunić & Ćesarević, 2025). Empirical research on AI-generated content disclosure in (sports) journalism indicates that transparency about content origin can influence perceived credibility, directly affecting editorial policies, verification standards, and communication strategies toward audiences (Rossner et al., 2024). Concurrently, studies on sports journalists' professional role perceptions in the context of AI reveal tensions between innovation and professional norms - ranging from fears of diminished autonomy and quality to pragmatic acceptance of AI as an efficiency tool - necessitating organizational learning, new ethical protocols, and the redefinition of newsroom workflows (Humayun, 2025). Broader assessments of sports journalism underscore the need to understand sport simultaneously as practice and industry, as editorial, technological, and market logics increasingly intersect, thereby complicating transformation management (Hardin & Billings, 2025).

A shift in the academic focus toward the systemic implications of digitalization is suggested by bibliometric and trend studies, which offer a meta-perspective and demonstrate the increasing scholarly attention to digital change, platforms, and mar-

ket pressures in sports journalism research (Hafiar et al., 2025). Digital transformation, sustainability, and innovation are linked in parallel streams in sports business research, suggesting possible relationships between digitalization, "green" innovation, and performance outcomes, subject to the creation of suitable managerial mechanisms to integrate sustainability and technology goals. Roadmap-oriented research emphasizes methodical prioritizing and resource alignment, further conceptualizing digital transformation as an organized change program as opposed to an ad hoc technology endeavor (Magaz-González et al., 2024).

The ethical and normative aspects of digital change in sports are likewise becoming more and more prominent in contemporary writing. The emergence of analytics, wearable technology, and automated decision systems changes the balance between expert judgment and data-driven practice, as well as the power dynamics inside organizations (Kovaňvić, 2023). This poses concerns about appropriate technology integration at the governance level, such as how to define data quality standards, avoid relying too much on algorithmic recommendations, and strike a balance between performance goals, athlete welfare, and competition integrity. While advantages like increased fan experience, injury avoidance, and efficiency improvements are palpable, concerns like privacy invasion, unfair advantage, expert substitution, and organizational resistance are just as important, according to empirical and synthetic results. Consequently, digital transformation is increasingly conceptualized as a strategic change management program rather than a series of isolated technical implementations (Qi et al., 2024).

In sports media, platformization processes further redefine institutional roles and distribution channels, particularly in the context of mega-events, where digital ecosystems have become central infrastructures of visibility and commercialization rather than supplementary media layers (Mlađenović, 2025). Analyses of the digitalization of sports mega-events within the “platform society” framework show that the shift from television to platforms such as YouTube generates new asymmetries in access control, algorithmic visibility, moderation rules, and attention distribution, while simultaneously enabling new forms of co-production and narrative reprogramming by audiences and content creators. From a managerial standpoint, this reinforces the need to develop competencies in managing platform relationships, rights, audience data, and risks stemming from dependence on external digital infrastructures (Ludvigsen & Petersen-Wagner, 2022).

Finally, as generative AI becomes increasingly integrated into news production and distribution, including sports journalism, credibility emerges as a first-order managerial issue. The central question is not only whether to use AI, but how to ensure

transparency, accountability, and verifiability. Experimental findings on AI disclosure effects indicate that labeling content as AI-generated may reduce perceived reliability on average, even when audiences do not judge the content itself as less accurate or fair. Negative effects can be mitigated when richer transparency mechanisms, such as source disclosure, accompany AI-generated content. These insights imply that organizations must develop protocols extending beyond simple labeling, incorporating sourcing policies, editorial oversight, and audience communication strategies as integral elements of trust management in conditions of automation (Toff & Simon, 2024).

Theoretical Framework of Digital Transformation and Innovation in Sports and Media Organizations

Contemporary academic literature largely agrees that digital transformation represents a fundamental organizational change that goes beyond the mere introduction of new technologies. Rather than adopting a technologically deterministic perspective, dominant theoretical approaches conceptualize digital transformation as a process of profound reconfiguration of organizational strategy, structure, processes, and value creation mechanisms (Vial, 2019). In this sense, digital transformation entails a shift in business logic, market relationships, and internal organizational dynamics, a shift particularly evident in sports and media organizations operating within highly dynamic and platformized environments.

Within theoretical models of digital transformation, technology is treated as an enabler or trigger rather than the central driver of change. Vial (2019) defines digital transformation as a process in which digital technologies enable or constrain changes in organizational resources, structures, and practices with the aim of creating new value. Similarly, Verhoef et al. (2021) emphasize that digital transformation is a strategic process requiring the integration of digital technologies across all functional areas of the organization, alongside the redefinition of business models and organizational culture.

Platformization, datafication, and automation are three interconnected phenomena that represent this revolution in sports and media enterprises. The shift from linear value chains to multi-sided platforms that link companies, audiences, sponsors, and content producers is known as "platformization" (Nambisan et al., 2019). Datafication is the methodical gathering, processing, and strategic application of information on audience behavior, market trends, and performance. Work procedures, decision-making, and content management techniques are all impacted by automation. The

idea that digital transformation is really an organizational challenge is strengthened by the fact that these processes collectively call for new kinds of coordination, governance, and organizational design.

Dynamic Capabilities Theory provides one of the most influential frameworks for understanding how organizations respond to rapid technological and market change. According to Teece (2018), dynamic capabilities encompass the ability to sense opportunities and threats, seize opportunities, and reconfigure resources and routines to sustain long-term competitiveness. In digital environments, these capabilities gain heightened importance, as technologies accelerate change and increase uncertainty. Some scholars (Stanković, 2023; Jeličić, 2024) argue that digital transformation requires the development of specific digital dynamic capabilities, including experimentation, rapid iteration, and the integration of new technologies into existing organizational structures. In sports and media organizations, such capabilities are crucial for balancing the stability of the core product - such as competitive integrity or editorial standards - with the need for continuous innovation in distribution and monetization models.

Beyond adaptability, contemporary research links dynamic capabilities to organizational resilience. Organizations capable of rapidly reconfiguring resources and processes are better equipped to respond to crises, regulatory shifts, and disruptions in media ecosystems (Teece et al., 2016). This perspective is particularly relevant for sports and media organizations operating under high public scrutiny and reputational risk.

Theories of innovation and business models are essential to comprehending digital change. Digital technology, according to Rachinger et al. (2019), allow for new types of business model innovation, such as modifications to value propositions, distribution networks, and client interactions. Such innovations frequently entail a move away from traditional revenue streams like broadcasting rights and advertising and toward digital models centered on platforms, subscriptions, and interactive audience participation in sports and media organizations.

Contemporary theoretical approaches further emphasize the concept of value co-creation, according to which audiences and fans are no longer passive consumers but active participants in value creation through interaction, content production, and community engagement (Vargo & Lusch, 2016). While digital platforms facilitate co-creation, they also introduce managerial challenges related to moderation, control, and the maintenance of relationship quality with audiences.

Nambisan (2017) highlights that digital innovation reshapes the very nature of entrepreneurship and innovation, as organizational boundaries become blurred and

innovation increasingly occurs within networks and ecosystems. For sports and media organizations, this implies that innovation management involves orchestrating relationships with platforms, technological partners, and fan communities, rather than relying solely on internal product development.

A cogent analytical framework for studying sports and media organizations in digital environments can be created by combining theories of digital transformation, dynamic capacities, innovation, and business models. According to this theory, managerial choices, organizational capabilities, and market contacts all influence digital transformation, which is defined as an organizational shift made possible by technology. According to Yoo et al. (2010), dynamic capabilities explain how companies adapt to change, while business model and innovation theories explain how these adaptations manifest as new forms of competitiveness and value. In the context of digital transformation and market innovation, this integrated perspective offers a consistent foundation for understanding organizational and managerial difficulties in sports and media businesses as well as for evaluating their strategic answers.

Organizational and Managerial Challenges under Conditions of Digital Transformation: Conceptual Model and Research Propositions

Contemporary research in sport management and media studies increasingly emphasizes that the success of digital transformation depends less on technological solutions themselves and more on the organizational and managerial capabilities to integrate technologies into existing structures, processes, and market relationships. Rather than offering descriptive accounts of technological trends, recent scholarship focuses on identifying the key challenges that shape the outcomes of digital transformation and innovation in sports and media organizations (Bresciani et al., 2018).

One of the central organizational challenges concerns the reconfiguration of structures and processes in conditions of heightened complexity and accelerated change. Digital transformation often requires a shift from rigid hierarchical structures toward more flexible and agile organizational forms that enable rapid coordination and experimentation. However, research shows that sports and media organizations frequently retain traditional hierarchies due to regulatory requirements, public accountability, and the need to preserve the integrity of the sports product, thereby creating tension between agility and control (Hanelt et al., 2021).

Another significant organizational challenge involves the integration of analytics, marketing, and media functions. While digital transformation generates large volumes of data on performance, audience behavior, and market trends, organizations

often lack clearly defined mechanisms for consolidating and leveraging these data in strategic decision-making. Kane et al. (2021) argue that digitally mature organizations develop cross-functional structures and shared analytical platforms, whereas fragmented responsibilities reduce the potential value of data.

In this context, knowledge management and organizational learning emerge as critical success factors. Digital initiatives produce new knowledge, but without systematic learning and institutionalization, innovations remain isolated and short-lived. Research in sport settings suggests that organizations actively fostering knowledge-sharing mechanisms and reflective practices are better positioned to translate digital experiments into sustainable organizational routines (Felin et al., 2020).

At the managerial level, a dominant challenge concerns the development of digital and hybrid competencies. Digital transformation requires a combination of technological understanding, strategic thinking, and the capacity to lead people under conditions of uncertainty. Hess et al. (2020) describe managers in digitally transforming organizations as “orchestrators of change” rather than traditional process controllers.

Managing change and employee resistance presents an additional challenge, particularly in organizations with strong professional identities, such as sports clubs and media newsrooms. Digital initiatives may be perceived as threats to autonomy, professional standards, or job security, potentially generating passive or active resistance. According to Vial and Han (2022), successful digital transformation leaders combine formal change management mechanisms with communication, participation, and trust-building practices.

Data-driven decision-making constitutes another complex challenge. Although digital technologies enable sophisticated analytics, the literature warns of risks related to data overload, misinterpretation, and excessive reliance on algorithmic recommendations. Jöhnk et al. (2021) emphasize that the managerial value of analytics depends on the ability to combine quantitative insights with contextual knowledge and professional expertise, a balance particularly crucial in sport and media environments.

At the market level, digital transformation unfolds within a context of platform competition, where OTT services, social media platforms, and technology giants increasingly dominate content distribution and monetization. This ecosystem reduces the control of traditional organizations over audiences and revenue streams, compelling them to redefine value propositions and partnership strategies (Parker et al., 2016). Simultaneously, digital platforms enable intensified value co-creation and community management but also increase reputational risks. Active audience engagement

requires continuous balancing between openness, control, and accountability, especially given the high public visibility of sport and media (Ramaswamy & Ozcan, 2018).

An additional layer of complexity arises from ethical, reputational, and regulatory risks associated with artificial intelligence, automation, and emerging digital technologies. Growing concerns regarding algorithmic transparency, data privacy, and accountability for decisions affecting athletes, journalists, and audiences underscore that risk governance must become an integral component of digital transformation strategy (Floridi et al., 2018). Building on these theoretical insights, a conceptual model can be proposed in which digital transformation generates interconnected organizational, managerial, and market-level challenges. The effective management of these challenges mediates the relationship between digital initiatives and innovation or performance outcomes in sports and media organizations.

Conclusion

Digital transformation in sports and media organizations represents a complex and multidimensional process that extends beyond the mere adoption of new technologies. As this study has shown, its success depends on the alignment of technological initiatives with organizational structures, managerial capabilities, and strategic orientation.

The findings highlight that digital transformation is fundamentally shaped by the development of dynamic capabilities, cross-functional integration, and effective data governance. At the same time, increasing reliance on digital platforms and artificial intelligence introduces new challenges related to control, transparency, and trust. These challenges require not only technical solutions but also robust managerial and ethical frameworks.

Furthermore, the study emphasizes that digital transformation should be understood within a broader ecosystem context, where multiple stakeholders - including media organizations, sports entities, technology providers, and audiences - jointly influence value creation processes. In this sense, the transformation of sports media is not only organizational but also structural, affecting the nature of media products, production processes, and audience engagement.

Overall, the paper contributes to the literature by integrating insights from sport management, media studies, and information systems into a unified conceptual framework. It underscores that sustainable digital transformation is contingent upon the ability of organizations to balance innovation with governance, platform strategies with autonomy, and technological advancement with trust and ethical responsibility.

Limitations and Future Research

This study is conceptual and lacks empirical validation of the proposed framework. Additionally, the interdisciplinary nature of the literature introduces heterogeneity, while differences between types of sports and media organizations are not fully addressed. The rapidly evolving nature of digital technologies further limits the temporal stability of the findings.

Future research should empirically test the proposed relationships, adopt a stakeholder and ecosystem perspective, and examine the impact of emerging technologies such as AI on sports media production and trust. Longitudinal and comparative studies are also recommended to better understand contextual and temporal dynamics of digital transformation.

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DOPING (USING STIMULANT MEDICATIONS) AS A CRIMINAL OFFENSE AND MEDIA REALITY: AN ANALYSIS OF REPORTING ON PROHIBITED SUBSTANCES IN SPORT

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Abstract: The paper analyzes doping as a complex phenomenon at the intersection of criminal law and media reality, with a particular focus on the criminalization of doping and its representation in the media. Based on a review of relevant scholarly literature and a comparative legal analysis, the study highlights the existence of different legislative models and challenges in the relationship between sports law and criminal law, especially with regard to evidentiary standards and the proportionality of sanctions. At the same time, the analysis of media reporting shows that the media, through framing and dominant narratives, actively participate in shaping the social perception of doping, often contributing to the stigmatization of athletes, but also to the exposure of doping scandals. The key finding of the paper is the existence of a gap between legal regulation and media representation of doping, indicating the need for an integrated approach that connects legal mechanisms with responsible media reporting.

Keywords: doping, criminalization, media, sports law, stigma

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Introduction

Doping in sports is a complicated, multidisciplinary issue with social, ethical, legal, and medical aspects. Doping, in its broadest meaning, is the use of illegal substances or techniques to improve athletic performance, undermining the core values of equality, fair play, and sport integrity (Lakhel, 2025). From a historical standpoint, doping has progressed from simple stimulants to complex pharmaceutical and biotechnology interventions, making its legal and regulatory management even more challenging (Lakhel, 2025).

The World Anti-Doping Agency (WADA) and its Code play a key role as a global normative framework in the modern strategy to combat doping, which is based on a combination of sporting (disciplinary) and legal methods. However, in addition to sports consequences, a growing number of jurisdictions have implemented criminal law provisions that make some types of doping illegal. The manufacture, distribution, and administration of banned substances are among the doping-related practices that at least 37 governments have made illegal, according to recent study (Lockett et al., 2026). This pattern suggests that doping has evolved from a strictly athletic infraction to one including criminal culpability and public interest (Milišević et al., 2021).

The link between criminal law and sports disciplinary law, the proportionality of sanctions, and legal certainty are just a few of the theoretical and practical concerns raised by the criminalization of doping (Kostadinović, 2024). The lack of consistency in normative approaches at the worldwide level is reflected in the scholarly literature, which highlights different models of criminalization (e.g., models focused on fraud, protection of minors, or trafficking of narcotics) (Lockett et al., 2026). However, some scholars cast doubt on the efficacy of criminal law measures, pointing out that their implementation may have little preventive effect if sufficient institutional and educational mechanisms are not in place (Blank et al., 2021).

In addition to its legal dimension, doping has a strong media reflection that shapes public perception. Media coverage of doping scandals often extends beyond the realm of sport and enters the sphere of moral judgment and social stigmatization of athletes. Research shows that media exposure of doping cases can have long-term reputational consequences for athletes, exceeding formal sanctions and affecting their social and professional status (Petróczi et al., 2026). In this context, doping is not viewed solely as a legal or sporting issue, but also as a media-constructed reality.

The media, as key actors in shaping public opinion, play an ambivalent role: on the one hand, they contribute to uncovering doping scandals and promoting transpa-

rency in sport; on the other hand, through sensationalism and selective reporting, they may reinforce stigmatization and oversimplify the complex legal and ethical aspects of the issue. High-profile cases, including organized doping networks and systemic abuses, have demonstrated that media reporting often serves as an initial trigger for institutional responses and legal proceedings, as well as for the construction of public narratives about athletes' "guilt."

Examining the connection between doping as a criminal violation and how it is portrayed in the media becomes very important in this context. The formation of the social reality of doping and possible disparities between legal control and public perception can be understood through an examination of how the media covers banned substances. In light of this, the analysis of doping as a criminal violation and media reality via the prism of reporting on banned substances in sports is the topic of this paper. The purpose of the study is to investigate how the judicial system and media discourse interact, as well as how much the media influences how society views doping.

Literature Review

Academic research on doping has long since evolved past oversimplified views that characterize it only as an athlete's own moral failings. Previous research has already shown that doping is motivated by psychological, social, economic, and performance-driven factors. Ehrnborg and Rosén (2009) stress that environmental pressures, the need to preserve status, and the desire for social recognition are all factors that contribute to the use of illegal substances. Accordingly, Morente-Sánchez and Zabala (2013) show that athletes' attitudes on doping vary depending on their knowledge, beliefs, sports context, and perceptions of what "others" are doing. This changes the emphasis from the lone perpetrator to the sporting culture where doping decisions are made. Elbe and Barkoukis (2017) further systematize this shift, arguing that the psychology of doping shows how athletes' behavior emerges at the intersection of individual dispositions and social influences, rather than as a purely autonomous decision.

This line of reasoning is quantitatively reinforced by the meta-analysis of Ntoumanis et al. (2014), which identifies positive attitudes toward doping, social norms, and the use of legal supplements as some of the strongest predictors of doping intentions and behaviors, while morality and self-efficacy function as protective factors. Importantly, this challenges the dominant narrative of the "bad individual": if social norms and perceived permissibility are such strong predictors, doping must be understood not only as individual misconduct, but also as a socially produced form of deviant behavior. Bloodworth and McNamee (2010), in a qualitative study of young British athletes,

reach a similar conclusion from a different perspective: athletes generally endorse anti-doping values, yet simultaneously recognize a sporting environment in which suspicion that others are doping undermines the ideal of "clean sport." Bloodworth et al. (2012) further nuance this finding, showing that young athletes formally reject doping, but become more tolerant when the issue is framed in hypothetical scenarios involving undetectable substances or when supplementation becomes normalized.

The literature on doping prevalence highlights significant challenges in accurately estimating how widespread doping truly is. De Hon, Kuipers, and van Bottenburg (2015) emphasize that relying solely on positive test results underestimates the actual occurrence, as tests detect only a portion of doping behavior. Their review indicates that intentional doping among some elite athlete groups may be much more common than official figures suggest. However, Gleaves et al. (2021) caution that combining various study types produces highly inconsistent estimates, ranging from minimal to very high prevalence rates. This points to issues not only with the existence of doping but also with the reliability of measurement methods. Overall, while the exact numbers remain debated, there is consensus that official anti-doping data do not fully reflect the scope of doping.

The methodological uncertainty surrounding doping prevalence has significant consequences for both legal approaches and media coverage. When the empirical foundation for understanding the extent of doping is unstable, policies focused on repression and media alarm may be based on an incomplete or skewed picture. Elbe and Barkoukis (2017) highlight that psychological studies often use indirect indicators, like intentions or attitudes, rather than confirmed doping behavior. In combination with Gleaves et al. (2021), this underscores that the crucial concern is not just the quantity of doping, but also the definition and standards of evidence used to identify it. This distinction is especially important legally, where criminalization demands more rigorous proof than what is typically required in sports governance or media narratives.

Qualitative study offers a deeper understanding of how athletes enter "zones of vulnerability," whereas meta-analytical studies find broad determinants. Erickson, McKenna, and Backhouse (2015) demonstrate that athlete identity, moral position, familial ties, and the larger social milieu all play a role in preventing doping, in addition to awareness of banned substances. This subtly criticizes a limited teaching approach that limits doping prevention to knowledge about prohibited drugs. In a meta-synthesis of qualitative research, Williams et al. (2024) expand on this viewpoint by showing that "clean sport" obstacles and enablers are dispersed across capability, opportunity, and motivation. As a result, systems that only concentrate on individual education are unable to address risk-filled circumstances, team norms, and sports culture.

Didymus and Backhouse (2020) concretize this broader picture through narratives of rugby players, where both permitted and prohibited substances appear as means of coping with injuries, stress, competitive pressures, and expectations of masculinity. Their findings are significant because they frame doping not merely as a calculated pursuit of success, but also as a response to psychosocial pressures. This aligns partially with Ehrnborg and Rosén (2009), but extends further by showing that substances can become normalized within the everyday management of sporting life. At this point, the literature clearly transitions from a moral to a sociological interpretation of doping.

The literature is especially crucial when discussing the accountability of those around the athlete. Backhouse and McKenna (2011) show that although medical professionals generally have a negative attitude against doping, they frequently don't know enough about anti-doping legislation, which could cause them to unintentionally contribute to rule infractions. This viewpoint is extended to athlete support workers more generally by Mazanov et al. (2014), who demonstrate that support staff do not always have sufficient knowledge, ethical clarity, or awareness of their responsibilities within the anti-doping system. By attributing doping incidents to the conduct of a single athlete, these findings contradict the media's propensity to personalize blame.

Whitaker, Backhouse, and Long (2014) go further by showing that even athletes themselves are uncertain about their role in reporting others' doping. Thus, while the system expects active loyalty to the principle of "clean sport," it does not always provide a clear framework of responsibility or protection against the consequences of reporting. This insight connects with Williams et al. (2024): if anti-doping behavior is socially conditioned, whistleblowing cannot be reduced to individual courage alone, but depends on institutional trust.

There is broad agreement in the literature that prevention must begin earlier and extend beyond mere rule awareness. Lucidi et al. (2017) demonstrate that media literacy can have a preventive effect on adolescents' attitudes toward doping and supplements, which is particularly relevant for the concept of media reality. Their study suggests that messages from media and digital environments are not external noise, but active factors shaping perceptions of performance, the body, and the legitimacy of chemical enhancement. However, Gatterer et al. (2020), analyzing initiatives from 53 national anti-doping organizations, conclude that prevention programs remain predominantly informational rather than developmental, interactive, and contextualized. In other words, promising directions identified in research have not yet been consistently adopted in institutional practice.

Backhouse (2023) further highlights the category of so-called inadvertent doping – unintentional rule violations linked to supplements. This significantly complicates public discourse: not all doping cases result from deliberate cheating. Rather, some arise in the gray zone of the supplement market, unclear information, and procedural obligations that athletes find difficult to navigate. This distinction is crucial for both legal and media analysis, as sensationalist narratives of the "cheater" often fail to differentiate between intent, negligence, systemic failure, and contamination.

Legal scholarship on doping primarily addresses whether the existing anti-doping regime is sufficiently fair and whether sports law should be supplemented by criminal law instruments. Duval (2016) shows that the development of the WADA Code has strengthened normative frameworks for sanctioning, intent, and responsibility, yet has not resolved fundamental tensions between harmonization and fairness. Sumner (2017) argues that there is a basis for criminalizing doping, particularly in cases involving networks of production, distribution, and systemic undermining of sport integrity. However, her argument is not indiscriminately punitive; rather, it advocates selective and carefully calibrated criminalization. This distinguishes her position from popular calls for broadly harsher punishment of all doping-related conduct.

In this situation, procedural fairness becomes a crucial concern. Star and Kelly (2022) show that different countries have different first-instance anti-doping procedures, and that athletes' positions are greatly impacted by the length of the hearings and their access to legal counsel. This criticism is sharpened by Hessert (2022), who draws attention to issues with the sharing of self-incriminating information between state authorities and sports organizations, especially when the same behavior may be considered both a criminal offense and a sporting infraction. Here, the literature clearly relates to the problem at hand: the lines separating sports discipline, inquiry, and media "judgment" become progressively hazy once doping enters the domain of criminal law.

Henning et al. (2021) add further complexity by analyzing systemic doping through the framework of risk and enabling environments. Their provocative thesis suggests that, in certain contexts, systemic doping functions not only as a means of cheating, but also as a mechanism of risk management within the sporting environment. While this does not justify doping, it strongly challenges the dominant moral and legal personalization of blame. If doping is embedded within systems of preparation, control, expectations, and informal networks, focusing exclusively on the individual athlete becomes overly simplistic.

Engelberg, Moston, and Skinner (2015), examining athletes who have committed anti-doping violations, reach a similar conclusion from another angle: decisions to engage in doping are often embedded in normalized practices, pressures, and rationalizations

that extend far beyond the act itself. This suggests that both legal and media narratives centered on individual "moral failure" are empirically too narrow. At the level of communication studies, the literature shows that the media do not neutrally reflect doping, but actively construct it. Starke and Flemming (2017) demonstrate that responsibility for doping in German print and online media is attributed both to individual and systemic levels, but that individual attribution dominates when coverage is episodically framed. Thus, journalistic framing directly influences whether audiences perceive doping as the problem of a "corrupt athlete" or of the sporting system. This has clear implications for criminal law discourse, as episodic framing facilitates public acceptance of punitive approaches focused on individuals.

Stanley (2022) deepens this perspective through an analysis of media framing of doping suspicions during the Tour de France. She shows that framing operates within the historical and mediatized context of the sport: doping suspicion becomes embedded in existing narratives about the sport, its heroes, and its controversies. Consequently, media do not merely report potential rule violations, but produce a broader symbolic order in which suspicion can persist even before formal confirmation. This is crucial for understanding media reality, as it indicates that public "guilt" may arise well before legal or disciplinary decisions.

Similarly, Travan et al. (2025) show that the language used by Australian media when discussing performance-enhancing drugs is heavily infused with terms such as "cheating," thereby placing doping in a morally condemnatory register from the outset. Such labeling leaves little room for distinguishing between intentional fraud, systemic pressure, ignorance, or procedural complexity. In this sense, media not only simplify a complex phenomenon, but also reinforce a symbolic framework in which the athlete is already marked as a cheater. The literature also examines those who perceive themselves as "clean" athletes. Shelley, Thrower, and Petróczi (2021) show that clean athletes experience doping not only as a violation of fair play, but also as a source of frustration, distrust, and a sense of competing in a compromised system. Martinelli et al. (2023) extend this by demonstrating that clean athletes are affected not only by actual doping cases, but also by the anti-doping architecture itself, with its assumptions of suspicion, control, and procedural burden. These findings are significant because they shift the focus: the anti-doping system is not merely a neutral protective framework, but also a producer of experiences of injustice, stigma, and pressure.

For this reason, media reporting on doping affects not only sanctioned athletes, but the broader sporting culture. If the media consistently dramatize doping as an individual moral failure, while legal and sporting systems simultaneously generate prolonged suspicion and procedural uncertainty, a public reality emerges in which it

becomes difficult to distinguish between proven cases, suspicion, accusation, and social stigma. It is precisely at this intersection that the literature on doping, media, and law most clearly converges.

Three important findings may be drawn from the studied material. First, current research increasingly views doping as the result of interconnections between psychological, social, organizational, and market factors rather than attributing it to personal moral weakness. Second, legal research demonstrates that bolstering repression and harmonization does not always address fairness concerns; rather, it may raise new ones about proportionality, procedural protections, and the connection between criminal law and sports law. Third, media studies verify that the public's perception of doping is shaped by language, narratives of culpability, and framing, making the media active contributors to the social reality of doping rather than only information providers.

This creates a research gap that is directly related to this paper: while there is a large body of literature on the psychology of doping, anti-doping protocols, and media portrayals of specific cases, much fewer studies systematically link doping as a possible criminal law phenomenon with the media's creation of its social reality. To put it another way, not enough research has been done on how media coverage of banned substances affects the public's perception of doping as behavior linked to penalty, guilt, danger, and social criticism in addition to being a sporting infraction. This convergence of media representation and legal qualification is exactly what makes it a rational and academically sound area of study.

Taking into account the above, as well as the identified gap between the legal regulation and the media representation of doping, this paper is guided by the following research questions:

To what extent do legal approaches to the criminalization of doping differ across jurisdictions, and what are the key implications of these differences for legal certainty and procedural fairness?

In what ways does media reporting shape the social perception of doping, and to what extent does it diverge from legal standards and facts established in formal proceedings?

To what extent is there a discrepancy between the legal qualification of doping as a criminal offense and its media construction as a moral and social problem?

Criminalization of Doping: Comparative Legal Models and Challenges

Contemporary legal regulation of doping is no longer confined to autonomous sports law and disciplinary sanctions, but is increasingly entering the sphere of state criminal law. It is precisely at this point that a key comparative legal distinction emerges: while the World Anti-Doping Code is conceived as a global private-law framework for sporting sanctions, national legal systems are developing their own criminal-law responses, which differ significantly in scope, purpose, and legislative technique. Lockett et al. (2026), based on a mapping of legislation in at least 37 jurisdictions, identify five basic models: the comprehensive model, the trafficking-focused model, the minor-protection model, the contextual model, and the fraud-based model. This demonstrates that the criminalization of doping is not a single global legal pattern, but rather a set of different national responses to the same phenomenon.

In this sense, comprehensive criminalization models proceed from the assumption that doping simultaneously harms several protected interests: health, fairness of competition, and public trust in sport. By contrast, trafficking-focused models restrict criminal-law intervention primarily to the production, distribution, and mediation in the trade of prohibited substances, while the athlete often remains predominantly within the disciplinary sphere. Lockett et al. (2026) emphasize that legislative typologies depend on what a state primarily seeks to protect: the integrity of sport, public health, minors, or the property and fraud-related interests connected with competition. This means that the same doping-related act may in one state be treated primarily as a sporting offense, in another as a criminal offense, and in a third as a combination of both regimes (Jovanović & Atanasovska Cvetković, 2022).

A normative justification for this shift toward criminalization can be found in Sumner (2017), who argues that doping is not merely an internal violation of sporting rules, but also socially harmful conduct that may satisfy the criteria for criminal-law intervention. Her argument rests on three grounds: doping as cheating, doping as endangerment of health, and doping as a practice that undermines the "spirit of sport." However, although Sumner advocates criminalization, her position is not unconditionally expansive; on the contrary, her analysis suggests that only a model capable of explaining why sporting sanctions alone are insufficient can be considered sustainable. In other words, the mere moral undesirability of doping is not, in itself, sufficient for every anti-doping violation automatically to become a criminal offense.

This opens an important point of controversy. If, as Lockett et al. (2026) show, states employ five different legislative typologies, then Sumner's thesis on criminalization cannot be implemented as a single universal model, but only as a selective and con-

textual criminal-law policy. It is precisely this distinction between normative justification and legislative fragmentation that constitutes the first major challenge: criminalization of doping may appear attractive as a political message of determination, yet in practice it produces a fragmented landscape of uneven rules and sanctions.

The fundamental problem of criminalizing doping lies not only in what is punished, but also in who punishes and according to which rules (Jovanović, 2022). Sports law, based on the WADA Code, has developed its own normative system, with autono-mous rules of liability, results management, and sanctioning. Duval et al. (2016) show that the 2015 reform of the WADA Code further strengthened the role of intent in sanctioning, but did not abandon the underlying logic of the anti-doping system, in which sporting liability is constructed differently from criminal liability. This means that the relationship between sports law and criminal law is not one between two identical subsystems, but between two normative logics that overlap only partially.

In this regard, Hessert (2022) particularly emphasizes that the parallelism of sporting and criminal proceedings creates serious tensions, especially where sports organizations and state authorities exchange information. His central argument is that an athlete may be compelled, in an internal sports proceeding, to provide information of a self-incriminating nature, which may then become relevant in a state criminal proceeding. This raises the question of whether the autonomy of sports law, often justified by the need to efficiently preserve the integrity of competition, comes into conflict with the basic procedural guarantees characteristic of criminal law. Hessert therefore does not simply challenge cooperation between sports bodies and state authorities, but shows that such cooperation must have clear limits if procedural fairness is to be preserved.

This observation logically builds on Star and Kelly (2022), who empirically show that procedural fairness in anti-doping disputes is not uniform even at the sporting level itself. Their analysis identifies problems relating to the timeliness of proceedings, access to legal assistance, the quality of reasoning in decisions, and the general standard of first-instance hearings. Particularly significant is their warning that delays may directly hinder an athlete's ability to establish the origin of a prohibited substance or to organize an effective defense. When this finding is connected with Hessert's analysis of parallel proceedings, an important conclusion emerges: before doping is moved further into the sphere of criminal law, it must first be determined whether the existing sports procedure is itself sufficiently fair and procedurally robust.

In other words, the relationship between sports law and criminal law is not merely a technical issue of jurisdiction, but a question of standards of justice. While Sumner (2017) views criminalization as a potentially necessary reinforcement of the anti-

doping regime, Hessert (2022) and Star and Kelly (2022) warn that any "strengthening" of repression without clear procedural delimitation may lead to legal uncertainty, double burdens on athletes, and a weakening of the system's legitimacy. In this sense, the criminalization of doping cannot be considered in isolation from the quality of sports proceedings; on the contrary, the greater the degree of overlap with state law, the more important precise coordination between these two regimes becomes.

The issue of proof in doping cases represents a central legal challenge, because it is precisely here that the difference between the sporting and criminal approaches becomes most visible. Duval et al. (2016) show that the 2015 reform of the WADA Code increased the significance of the concept of intent, especially in the context of sanctions, but did not abandon a structure in which the sporting system remains oriented toward the efficient detection and punishment of violations. This is significant because sports law seeks to preserve the integrity of competition swiftly, whereas criminal law prioritizes a higher level of evidentiary certainty and protection of the accused. Consequently, what may be sufficient for a sporting suspension need not necessarily be sufficient for a criminal conviction.

Star and Kelly (2022) further intensify this problem by pointing out that procedural deficiencies are not merely formal errors, but can directly affect the possibility of proof itself. When proceedings are delayed, when an athlete lacks timely access to documentation, or when a first-instance decision is insufficiently reasoned, the quality of fact-finding is weakened as well. This is especially important in doping cases, where the defense often depends on precise reconstruction of the route by which a substance entered the body, laboratory documentation, and short procedural time limits. In this sense, the problem of proof is not only scientific and technical, but also procedural.

Star (2023) goes a step further, showing that harmonization of the anti-doping system remains partial and uneven in practice. Her analysis of the Indian case reveals that formal compliance with WADA rules does not guarantee equally high-quality implementation in terms of testing, athletes' rights, and proportionate sanctioning. This finding is of great comparative importance: if implementation varies significantly across states and national anti-doping organizations, then the burden of proof and the effects of sanctioning do not affect athletes equally. This undermines the idea that the global anti-doping system automatically produces "equal conditions" and opens the way for the criticism that criminalization, in such an uneven environment, may further deepen inequalities.

Closely related to this is the issue of sanctioning. Sumner (2017) considers penal intervention justified when sporting sanctions are insufficient to protect the core va-

lues of sport and society, but Lockett et al. (2026) show that, in practice, sanctions are structured very differently depending on the legislative typology. Where the fraud model predominates, the emphasis is on unfair competitive advantage; where the protection-of-minors or trafficking model prevails, sanctioning is directed primarily at supply networks and exploitation. This means that there is no single answer to the question of "what should be punished most severely": the athlete, the athlete's support team, distributors, or organized supply chains. For this reason, comparative legal scholarship does not support simple intensification of penalties, but instead requires a clear identification of the protected legal interest and a proportionate choice of sanction.

Finally, in cases involving minors or particularly vulnerable athletes, the issue of sanctioning acquires an additional dimension of proportionality. Hessert (2021) shows that sports investigative procedures involving minor athletes may include highly invasive forms of data collection, concluding that existing sports regulations do not always provide sufficient protective mechanisms for this group. Although his work does not deal exclusively with criminal sanctions, it is important for the broader debate on the criminalization of doping because it warns that a repressive model without a differentiated approach to vulnerable categories may produce serious disproportions. It follows that the issue of sanctioning cannot be separated from the status of the offender, the context of the violation, and the intensity of procedural guarantees.

From a comparative legal perspective, the criminalization of doping has not developed as a single, stable, and globally harmonized model, but rather as a set of different normative strategies that vary according to the protected interest, procedural structure, and concept of sanction. Lockett et al. (2026) demonstrate the diversity of legislative typologies; Sumner (2017) provides the normative argument for criminalization; Duval et al. (2016) point to the distinctiveness of the sports sanctioning regime; Hessert (2022) raises the issue of self-incrimination and parallel proceedings; and Star and Kelly (2022), as well as Star (2023), show that fairness and harmonization in implementation are not complete even at the sporting level. The central challenge is not merely whether doping should be criminalized, but how this can be done without undermining proportionality, procedural fairness, and legal certainty.

The Media Construction of Doping: Between Information and Stigmatization

Contemporary scholarship shows that the media do not present doping neutrally, but actively frame it through specific interpretive patterns. In this sense, reporting on doping is not merely the transmission of information about prohibited substances or sanctions, but also a process of symbolically shaping meaning, responsibility, and

moral judgment. Stanley (2022), in her analysis of reporting on doping suspicions during the Tour de France, shows that media framing does not arise only once a formal rule violation has been established, but much earlier, already at the stage of suspicion, insinuation, and narrative association of the athlete with prior histories of doping in that sport. In this way, the media do not wait for the outcome of proceedings, but participate in producing a "pre-legal" image of guilt.

This finding is logically complemented by Travan et al. (2025), who show that Australian media systematically portray performance-enhancing drugs through the language of moral deviance, dominated by expressions such as cheating, violation of the spirit of sport, and unfair advantage. Particularly important is that the authors do not stop at the mere observation that the tone is negative; rather, they show that such a tone produces a broader normative framework in which the media assign themselves the authority to define "acceptable" sporting behavior for the community. In other words, the media do not merely report on doping, but also morally classify it (Mlađenović, 2025).

More precisely, Travan et al. (2023) demonstrate that the framing of doping in sport may also be nationally inflected. In their analysis of Australian media, doping is presented not only as an individual violation, but also as a space in which distinctions are produced between "us" and "them," that is, between domestic and foreign actors. Such nationalism in reporting is not a marginal feature, but an important mechanism for distributing moral condemnation and sympathy. This finding complements Stanley (2022): while Stanley emphasizes that the media generate suspicion before any formal decision, Travan et al. (2023) show that such suspicion is not distributed evenly, but may follow media and national hierarchies.

These studies suggest that media narratives about doping most often oscillate between three dominant frames: moral transgression, violation of fairness, and symbolic endangerment of the sporting community. The problem with this approach is not simply that it is critical of doping, but that it often oversimplifies cases in which there are important differences between intent, negligence, procedural dispute, and systemic pressure. It is precisely for this reason that the media construction of doping cannot be reduced to informing the public; it is an active process of selection, emphasis, and moral evaluation.

When one moves from general framing to the consequences for the athlete, the literature shows that the reputational effect of media reporting is often broader and longer-lasting than the sporting sanction itself. Tu and Li (2022), in their analysis of Chinese social media users' responses to the controversy surrounding Sun Yang, show that digital audiences do not remain passive, but actively participate in defending or undermining the athlete's reputation. Their findings indicate a predominance of

emotional support, but also the use of reputational defense strategies such as denial, attacking the accuser, and reminding audiences of the athlete's prior achievements. This means that the media sphere does not produce only stigma, but also counter-discourses of defense, particularly when the athlete is already strongly associated with national identity and symbolic capital.

However, this very possibility of defense does not eliminate reputational risk; rather, it shows how dependent reputation has become on media dynamics. Tu and Li (2022) clearly demonstrate that the struggle over the meaning of a doping case unfolds publicly, in real time, and with strong emotional mobilization of audiences. Their work therefore complements Stanley (2022) well: while Stanley shows how the media produce suspicion through journalistic narratives, Tu and Li show how that suspicion is subsequently translated into a digital struggle over reputation. In both cases, the athlete is exposed to a form of "public trial" that does not depend entirely on the formal legal outcome.

This problem is sharpened further by Grimes and Cox (2026), who analyze anti-doping rhetoric as a source of stigmatization. Their central argument is that the dominant language of anti-doping policy and public discourse produces a division between "clean" and "dirty" athletes, with even unintentional violators often facing public condemnation, exclusion, and reputational harm. Although their work is not a study of media content in the narrow sense, it is highly relevant to this topic because it shows that media stigmatization does not arise in a vacuum, but relies on an already moralized discourse embedded in the anti-doping system itself. In this way, media reality and institutional rhetoric reinforce one another.

In other words, the media influence athletes' reputations not only by "publishing bad news," but also by translating certain cases into enduring identity labels: suspicious, cheater, discredited, national disgrace, or conversely, victim of the system and target of unfair accusations. For this reason, reputation in doping scandals is less the result of the fact itself or the sanction imposed, and more the result of a public struggle over how that fact is interpreted.

Recent research shows that the media are no longer merely a channel through which the public learns of doping cases, but have become actors in the discovery, monitoring, and amplification of doping scandals. Fischer and Birren (2023) therefore describe social media as a growing element of doping enforcement and control. Their study identifies three important functions of digital media: agenda-setting by anti-doping organizations, normative control through posts by athletes and audiences, and the development of social media as a space of surveillance and signaling of suspicious behavior. This is an important shift in the literature, as it means that the media are no

longer merely intermediaries between institutions and the public, but part of the very infrastructure of control.

Tu and Li (2022) provide a concrete example of how this occurs in practice: in the Sun Yang case, the initial impulse of public controversy was connected with media exposure of problematic conduct, after which sports institutions, state media, and audiences on social networks became involved. Their analysis shows that the media exposure of a scandal does not end with publication of the information; on the contrary, it triggers a multi-layered communicative process in which the case is reinterpreted, contested, nationalized, and emotionally dramatized. Thus, the media not only "reveal" the scandal, but also determine the rhythm of its public life.

Schnitzer et al. (2025) add to this picture from the perspective of audiences and sporting events. Their study shows that a doping scandal during a major sporting event does not necessarily automatically undermine spectator satisfaction on site, but it remains registered as a negative element of the experience and must be included in the organizers' communication and crisis-management strategy. This is an important finding for the topic of the media construction of doping: even when audiences do not abandon the event or radically alter their overall satisfaction, the very fact that a doping scandal becomes part of the "event experience" demonstrates how media visibility changes the symbolic status of the competition itself. Thus, the media affect not only the athlete, but also the perception of sport as a product. A well-known example illustrating the role of media in shaping public perception is the case of Chinese swimmer Sun Yang. Although the legal proceedings focused on procedural issues and anti-doping rule violations, media coverage - particularly on social and digital platforms - constructed a polarized narrative of guilt and national identity. This case demonstrates how media discourse may precede and even overshadow formal legal findings, contributing to reputational consequences that extend beyond the legal outcome (Tu, Li, 2022).

For this reason, contemporary scholarship suggests that the media should be viewed in a threefold way: as producers of interpretive frames, as intermediaries of reputation, and as integral parts of the mechanisms for revealing and sustaining doping scandals in public life. Stanley (2022) shows how suspicion is shaped; Travan et al. (2023; 2025) show how that suspicion is morally and nationally framed; Tu and Li (2022) show how reputation is defended or undermined in the digital public sphere; Fischer and Birren (2023) show that digital media are increasingly entering the sphere of surveillance and control; and Schnitzer et al. (2025) show that media scandal also leaves a trace on the perception of the sporting event itself. This confirms that doping in the media is not merely a topic of information, but a socially constructed reality with real reputational and institutional consequences.

Conclusion

Doping in sport is a complex phenomenon that goes beyond the boundaries of an individual violation and requires an integrated consideration of both legal and social dimensions. The literature review shows that doping is increasingly understood as the result of interactions among individual, social, and institutional factors, rather than exclusively as the moral deviance of a single person.

The analysis of the criminalization of doping points to the existence of different legislative models and the absence of a single unified approach at the global level. A particular challenge lies in the relationship between sports law and criminal law, especially with regard to standards of proof, procedural guarantees, and the proportionality of sanctions. These issues point to the need for careful normative balancing between efficiency and fairness. At the same time, the media play a key role in shaping the social perception of doping. Through framing and narrative strategies, they often simplify the complexity of the phenomenon and contribute to the stigmatization of athletes, while also playing an important role in uncovering doping scandals and promoting transparency.

The key conclusion of this paper is that there is a significant gap between the legal regulation of doping and its media representation. While the law strives for precision and procedural fairness, media discourse often favors simplified and normatively charged interpretations. For this reason, an effective fight against doping requires a coordinated approach that connects legal mechanisms with responsible media reporting.

Conflict of interests:

The authors declare no conflict of interest.

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Premović, J., Jovanović, S., Dobričanin, S. (2026). The influence of manager's activities and characteristics on strategic action and businesss results with moderation affects on motivation and reward (example of Serbia), *Sport media and business,* 12(1) 129-146

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THE INFLUENCE OF MANAGER'S ACTIVITIES AND CHARACTERISTICS ON STRATEGIC ACTION AND BUSINESS RESULTS WITH MODERATION EFFECTS ON MOTIVATION AND REWARD (EXAMPLE OF SERBIA)

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Abstract: Uncertainty and changeability of the modern market impose a need for strategic, proactive action of the company. The goal of the company is to achieve competitive advantages which require the application of strategic management. Efficiency of strategic action is conditioned by the management activities which are carried out in the company, but also by the characteristics of managers who are in charge of their realization. The authors research the activities and characteristics of managers in business improvement and achieving the best possible competitive position of the company. In that purpose, the original empirical research is conducted in which participated 327 managers of different levels employed in companies in Serbia. The research results were processed using a software program IBM SPSS Statistics 25 and they confirmed the influence of the manager's activities and characteristics on the achievement of more efficient and productive work, through the effective strategic action of the company.

Keywords: managers, strategic management, motivation, reward, competitive advantages, sports management

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Introduction

Adapting to numerous and diverse changes, but also their initiation, creation and timely introduction, with a constant increase in competitiveness and improvement of business performance, is a basic assumption not only for the development of modern companies, but essentially for their survival in today's dynamic market. Alongside conventional business systems, these issues are particularly pronounced within sports organizations and the sports industry, which function in highly dynamic and competitive settings marked by swift shifts in consumer preferences, technological advancements, and global rivalry. Sports clubs, federations, and organizations are increasingly dependent on strategic management to sustain competitive performance, guarantee financial viability, and improve fan engagement. In the realm of sports management, the responsibilities of managers become significantly more intricate, as they must not only strive for business efficiency but also reconcile sporting outcomes, brand equity, and stakeholder expectations. For instance, professional sports clubs are tasked with the simultaneous management of team performance, marketing initiatives, sponsorship partnerships, and fan loyalty, rendering strategic actions and managerial skills essential factors for success. A strategic approach to management indicates the need for the organization's active attitude towards changes, which is characterized by the encouragement of changes by the organization itself, anticipating and ex ante reaction of the organization before the changes themselves occur, organizational climate and atmosphere in which innovation and creativity of employees are stimulated and developed, etc. Strategic management enables organizations to develop dynamic capabilities and adapt to changing environments, which is essential for achieving long-term competitiveness (Teece, 2020). It can be said that the primary task of strategic management as change management is providing a organization's rational and timely answers to the changes of internal and external surroundings which are constantly happening (Premović, 2022a). In sports organizations, fan engagement and stakeholder management represent critical components of strategic success, further emphasizing the importance of effective management practices (Kunkel et al., 2022).

In order for the company to succeed in ensuring the survival, growth and development of the best possible competitive position, it must have successful leaders who are efficiently going to lead the company through numerous changes and different business challenges. To gain the competitive advantages, it is necessary to have an effective strategic action, which is conditioned by the activities that the management carries out in the company, but also by the characteristics of the managers who are in charge of their implementation.

Precisely for these reasons, the main goal of the authors in this paper is to point out the importance of certain variables of activity and characteristics of managers that have a great influence on the variables of strategic action, so that they could be improved and applied in the company's operations. The original empirical research conducted in companies in Serbia and the results obtained should indicate whether there is an influence (and if so, to what extent) between the variables of activity and characteristics of managers and the variables of strategic action.

Lierature review

In the second half of the 20th century, society as a whole faced numerous challenges that brought with it various social, economic, technical-technological and political changes in all areas and human activities. These changes had their repercussions on business systems and companies, imposing a new business philosophy of organizational behavior and action as an imperative for success (Premović, 2022a). The business and success of a organization depends on many factors. In the conditions of modern globalization and growing competitiveness, the struggle for survival in the market and winning customers is an increasingly difficult and complex mission for every organization (Turčinović, 2021). Globalization has introduced profound changes to the operational strategies of traditional corporations, compelling them to restructure in order to compete as global players (Pavlović et al., 2025). Recent global challenges, such as economic instability and external shocks, have further emphasized the importance of strategic adaptability and resilience of organizations (Wójcik, 2021). The main sources of gaining competitive advantages have changed over time. In this context, the resource-based view emphasizes the importance of internal resources, particularly human capital and managerial competencies, as key sources of sustainable competitive advantage (Barney, Mackey, 2021). Contrary to previous times in which the success of companies and national economies, in general, was measured by the amount of products produced and sold, today world society is turning to the service sector, in which the dominant place is occupied by human resources and the field of intellectual capital, which is at the disposal of one organizational system (company, institution, country) (Premović &Dudić, 2024) A company's performance is heavily influenced by internal factors, such as business strategy, operational efficiency, and ownership structure, and external factors, such as market uncertainty and competition intensity (Handoyoa et al., 2023). Management decisions are based on the analysis of data and information (measurement, analysis, use of tools, techniques and methods). Tools and methods are practical techniques, concepts, skills, means or mechanisms that can be applied to solve

specific tasks and problems related to quality management systems (Turčinović et al., 2022). Motivation is a significant factor that influences employees, their job satisfaction and their willingness to improve and apply their knowledge and skills for the benefit of the company as an employer (Premović, 2022).

A strategic approach in change management and human resource management is taking the place of the dominant management paradigm (Premović, 2022a). Strategic management gives a broader perspective to the employees of an organization and they can better understand how their job fits into the entire organizational plan and how it is co-related to other organizational members (Stamevska et al., 2019). It is extremely important because it can provide managers with a systematic and comprehensive means to analyze the organization's internal and external environment, assess strengths and weaknesses, both internally and externally, and identify opportunities through which they can develop and exploit a competitive advantage (Farid, 2022). Strategic management has become an essential part of business in today's dynamic and competitive environment (Susanto et al., 2023). As author emphasis "strategic management increases the organization's ability to act preventively because it promotes interaction between manager's at all vertical, horizontal, and functional levels, and creates a basis for identifying and rationalizing the need for change for all managers and employees in the organization" (Milačić, 2024).

Research methodology

The original empirical research is conducted on the territory of Republic of Serbia by online survey questionnaire. The sample was chosen through a non-probability convenience sampling technique, incorporating managers from various companies across different sizes and sectors within the Republic of Serbia. The survey was disseminated electronically through email and professional networks. In total, 450 questionnaires were sent out, and 327 valid responses were obtained, yielding a response rate of 72.6%, which is deemed satisfactory for this category of research. The company's strategic action was analyzed through the effectiveness of strategic decisions, the quality of the organization's vision and mission, as well as strategic planning and decision-making (Jovanović, 2022). Furthermore, the companies were observed from the aspect of conducting innovative and research activities, the concept of change management and striving to achieve a greater market share. Improving the quality and competitiveness of business is the basis of the analysis of the strategic action and direction of the company. This is consistent with previous rese-

arch, which highlights that innovation plays a crucial role in improving organizational performance, especially in sports organizations (Winand & Anagnostopoulos, 2020).

The research presented in the paper proves the following hypotheses:

- **Special hypothesis 1 (H_1):** By improving the activities of the management and the company, the efficiency of strategic action is improved.
- **Special hypothesis 2 (H_2):** The characteristics of managers have an impact on the effectiveness of the implementation of strategic decisions and adequate employee motivation and reward.

The research results were processed using a software program IBM SPSS Statistics 25. The method used in data processing is descriptive statistics for analyzing the significance and value of the observed variables. Correlation and regression analysis determined the mutual influence of the analyzed variables and presented the contribution of individual variables. Factor analysis determined the relationship between the observed variables analyzed from the aspect of the importance of business improvement. The research included a sample of 327 managers of different gender, age, level of education and position employed in companies of various size, structure and activities in Serbia (Table 1).

Table 1. Structure of the sample - respondents who participated in the research

VARIABLE		f	%
GENDER	Male	189	57,8%
	Female	138	42,2%
AGE	under 35	84	25,7%
	35 to 50	183	56%
	over 50	60	18,3%
YEARS OF SERVICE	less than 15	147	45%
	15 to 30	144	44%
	over 30	36	11%
EDUCATION	High School	41	12,5%
	College diploma	71	21,7%
	University degree	215	65,8%
POSITION IN COMPANY	Operational-Executive Management	189	57,9%
	Middle Management	79	24,1%
	Top Management	59	18,1%

Source: Original research by the authors (Premović et al., 2025)

Analysis of variables used in the research

Respondents evaluated variables showing which activities and characteristics of managers were the most important for their company, but also they evaluated strategic planning, decision-making and directing the organization using strategic action variables. Variables of the company's strategic action are: Effectiveness of strategic decisions, Quality of vision and mission, Strategic planning, Strategic decision-making, Change management, Innovative and research activities, Greater market share, Improvement of business quality, Improving business competitiveness (Table 2).

Variables of strategic action were evaluated using a semantic differential scale where the values range from 1-5, where 1 = very low, 5 = very high. Variables of activities and characteristics of the managers were evaluated using a 5-point Likert scale, where 1 = strongly disagree, 5 = strongly agree (Premović et al., 2025)

Table 2. Descriptive statistics of variables of the company's strategic actions

Variable	Label	N	Min	Max	Mean value	Standard deviation
Effectiveness of strategic decisions	SD1	327	1	5	3,53	1,002
Quality of vision and mission	SD2	327	1	5	3,63	1,119
Strategic planning	SD3	327	1	5	3,46	1,047
Strategic decision-making	SD4	327	1	5	3,47	1,093
Change management	SD5	327	1	5	3,34	1,106
Innovative and research activities	SD6	327	1	5	3,31	1,265
Greater market share	SD7	327	1	5	3,58	1,156
Improvement of business quality	SD8	327	1	5	3,63	1,071
Improving business competitiveness	SD9	327	1	5	3,60	1,120

Source: Original research by the authors (Premović et al., 2025)

The Table 2 shows the abbreviations for the mentioned variables of strategic action, which will be used in further research analyses. All the scores of the analyzed variables exceed their mean value of 2.5. This indicates that the respondents are satisfied with the company's strategic performance and performance on the market (Premović et al., 2025). The lowest ratings variables are innovative and research activities and change management which indicate that the analyzed companies do not pay much attention to precisely those segments that are necessary for them to maintain or improve their market position in an unpredictable environment. If modern company wants to survive on the market and improve its position, it must be ready to follow all changes in the environment and adapt to them. It must be ready to invest in research and development, the product of which should be innovative behavior on the market (Premović et al., 2025).

The following table presents descriptive statistics of the variables of management activities. The variables of management activities are: Leadership, Communication, Motivation, Rewarding, Team cooperation, Involvement of employees in decision-making,Training and development of employees (Table 3).

Table 3. Descriptive statistics of management activity variables

Variable	Label	N	Min	Max	Mean value	Standard deviation
Leadership	AM1	327	1	5	3,54	1,215
Communication	AM2	327	1	5	3,76	1,091
Motivation	AM3	327	1	5	3,46	1,245
Rewarding	AM4	327	1	5	3,40	1,311
Team cooperation	AM5	327	1	5	3,78	1,157
Involvement of employees in decision-making	AM6	327	1	5	3,47	1,329
Training and development of employees	AM7	327	1	5	3,59	1,163

Source: Original research by the authors (Premović et al., 2025)

As been seen in the Table 3, all the mentioned variables were rated highly by the respondents, that is, they have a value higher than the average value of 2.5. The best evaluated variables of management activities by the respondents are team cooperation and communication. On the other side, the lowest rated variables of management activities are rewarding and motivation.

The Table 4 shows the descriptive statistics of manager characteristic variables.The variables of the manager's characteristics are: Taking the initiative, Trust and commitment, Risk taking, Conflict resolution, Improvement and advancement of knowledge, Organizational skill, Innovation and flexibility.

Table 4. Descriptive statistics of manager characteristic variables

Variable	Label	N	Min	Max	Mean value	Standard deviation
Taking the initiative	KM1	327	1	5	3,45	1,197
Trust and commitment	KM2	327	1	5	3,65	1,156
Risk taking	KM3	327	1	5	3,54	1,260
Conflict resolution	KM4	327	1	5	3,55	1,199
Improvement and advancement of knowledge	KM5	327	1	5	3,61	1,193
Organizational skills	KM6	327	1	5	3,58	1,076
Innovation and flexibility	KM7	327	1	5	3,50	1,228

Source: Original research by the authors (Premović et al., 2025)

According to these results, the variable characteristics of managers are rated with high marks, where it can be seen that all analyzed values have grades that exceed the mean value of 2.5. Trust and commitment, training and improvement of know-

ledge and limiting abilities are the best rated while the lowest rated variables are initiative taking and risk taking (Premović et al., 2025).

Correlation analysis with the moderating effect of employee motivation and rewarding

Correlation relations between management activity variables and strategic action variables were compared in those companies that actively implement employee motivation strategies and various techniques of adequate reward according to the achieved work results, and those companies that do not practice it. The aforementioned relationships are shown in the following Table 5.

Table 5. Correlation between the variables of management activities and the variables of strategic action with the moderating effect of motivation and rewarding employees

	AM1	AM2	AM3	AM4	AM5	AM6	AM7
SD1	,556**	,625**	,586**	,506**	,380**	419**	,492**
SD2	,725**	,491**	,547**	,583*	,524**	,500**	,580**
SD3	,614**	,718**	,628*	,596**	,498**	,551**	,461**
SD4	,705**	,757**	,559**	,685**	419**	,641**	,474**
SD5	,514**	,653**	,755**	,503**	,499**	,402**	,360**
SD6	553**	,506**	,639**	,561**	,404**	454*	,488**
SD7	,526**	,693**	,539**	,521**	,477**	,527**	,402**
SD8	,681**	,766**	,603**	,565**	,655**	,594**	,534*
SD9	,670**	,698**	,660**	,640**	,581**	,601*	,443**
		267	267	267	267	267	267
SD1	,431**	,301*	,431**	,310*	,356**	389*	,296*
SD2	,382**	,273*	,554**	,321*	,318*	,459**	,240
SD3	443**	,331**	,550**	,399**	,514**	,454**	,503**
SD4	440**	,360**	,574**	,447**	,640**	,506**	,514**
SD5	,604**	,426**	,476**	,496**	,473**	,500**	,295*
SD6	,457**	,321*	467**	,487**	,478**	,456**	,451**
SD7	,393**	,522**	,502**	,301*	,360**	,257*	,430**
SD8	,465**	,584**	,548**	,315	,426**	,432**	,500**
SD9	,289*	,527**	,485**	,273*	,331**	,268*	,501**
		60	60	60	60	60	60

Source: Original research by the authors

** The correlation is significant at the 0.01 level.

* The correlation is significant at the 0.05 level.

Correlation relations between management activity variables and strategic action variables indicate that there are statistically significant relationships of different in-

tensity and influence between companies that motivate and reward their employees and those companies that do not.

The variables strategic decision-making showed a distinct connection and high correlation with the variables leadership and communication in those companies in which motivation and reward activities of employees are actively carried out. In addition, these two variables of management activities showed a strong correlation with the variables of the quality of vision and mission, strategic planning, but also the improvement of business quality. This indicated that in companies where different strategies for motivating and rewarding employees are implemented, effective communication and success of leaders in leading their employees towards the achievement of the company's goals is achieved through adequate strategic planning and decision-making.

High correlation values and a strong connection were achieved by the motivation variable with the change management variable. Those companies that have a motivated workforce have great potential and the ability to successfully predict and implement changes in their environment, which certainly represents an important factor in the survival, growth and development of companies in unpredictable business conditions.

When it comes to companies that do not encourage their employees to work efficiently through motivation and rewards, a weak correlation can be observed between the leadership variables and the improvement of business competitiveness. As human capital is a key tool in achieving competitiveness in modern business, company leaders who have a workforce that is not motivated and encouraged to work better and more, will not even have the opportunity to encourage changes in such an environment that lead to the progress and development of the organization. In addition, organizations that do not motivate and reward their employees prevent their greater engagement and the achievement of effective communication that contributes to the exchange of knowledge, ideas and opinions. Thus, effective strategic decision-making and planning, as well as the achievement of a quality vision and mission, are prevented. Such an organization does not encourage the innovative and creative potential of its employees and does not develop the company's research activities. This is indicated by the established low correlation between the variable of communication and the variables of effectiveness of strategic decisions, quality of vision and mission, strategic planning and decision-making, and innovative and research activities.

The variables effectiveness of strategic decisions and the quality of vision and mission show a small correlation with the variables reward, team cooperation and training and

development of employees. The low correlation of the establishment is also between the variables of greater market share and improvement of business competitiveness with the variables of reward, teamwork and involvement of emplo-yees in decision-making. These relationships once again confirm that companies build their success on the market and the acquisition of a better competitive position through effective strategic direction and action, which they cannot achieve without the human factor. Companies must invest in human capital, train and improve it. In addition, the success of the company can be built on human resources that are motivated, involved in the decision-making process and oriented towards team cooperation, and adequately valued and rewarded for their invested effort and work.

A low correlation value was established between the variables of training and employee development and the variables of change management. This relationship once again confirms the importance of training and development of employees, as an important factor and bearer of changes in the company's operations. The success of leaders in effectively implementing changes largely depends on the ability of employees to understand and understand what the change represents for them, and certainly that adequate information and acquired knowledge will help them in this.

The above relationships (Table 5) indicate that there are variations in the established correlations between companies that manage employee motivation and rewards and those that do not. The aforementioned claims proved the special hypothesis H_2. This indicated that the variables of management activities show statistically significant relationships with the variables of strategic action with the moderating effect of motivation and rewarding employees.

Factor analysis

All the analyzed variables of activities and characteristics of managers and strategic actions can be classified under one, which is that they are factors that contribute to the improvement of the company's operations. From that aspect, a factor analysis was performed. The data presented in the research results are suitable for factor analysis, given that there is a large interdependence of factors. The high interdependence of the factors is confirmed by the correlation ratios that exceed 0.3. The value of the KMO indicator is 0.950, which exceeds the recommended value of 0.6, while Bartlett's test of sphericity reached statistical significance, which all indicates the factorability of the correlation matrix.

Table 6. Explanation of total variance

Components	Initial value			Extraction of Sum of Squares of Loads			Rotation of Sum of Squares of Loads
	Total	% variance	cumulative %	Total	% variance	cumulative %	Total
1	15,766	68,548	68,548	15,766	68,548	68,548	15,766
2	1,511	6,568	75,116	1,511	6,568	75,116	1,511
3	,737	3,203	78,319				
4	,643	2,797	81,116				
5	,613	2,664	83,780				
6	,495	2,153	85,933				
7	,392	1,706	87,640				
8	,379	1,649	89,288				
9	,324	1,407	90,695				
10	,273	1,186	91,881				
11	,250	1,086	92,967				
12	,216	,937	93,904				
13	,209	,907	94,811				
14	,192	,836	95,648				
15	,168	,732	96,380				
16	,150	,654	97,034				
17	,145	,628	97,662				
18	,134	,581	98,243				
19	,103	,450	98,693				
20	,088	,381	99,073				
21	,078	,339	99,412				
22	,074	,320	99,732				
23	,062	,268	100,000				

Source: original research by the authors

a. When the components are correlated, the sums of squared loadings cannot be added to obtain the total variance.

Principal components analysis revealed the presence of two components with characteristic values over 1, which explain a total of 75,1% of the variability. In order to interpret those two components more easily, an Oblimin rotation was performed, which included iterations. Based on the Oblimin rotation, a rotated solution was obtained, which separated two components. The presented results of this rotation indicate that those two components have a large number of factor weights, where almost all analyzed factors show significant weights, greater than 0.5, to only one of the components (Table 6).

The first component explains 68,54% of the variance and the variables that best describe it and have factor weights above one are trust and commitment and conflict resolution. The second component explains 6,56% of the variance, while the variable that best describes the effectiveness of strategic decisions.

Table 7. Factor analysis of observed variables strategic action, management activities and manager characteristics

Variables	Components	
	1	2
Trust and commitment	1,020	
Conflict resolution	1,008	
Risk taking	,918	
Rewarding	,855	
Involvement of employees in decision-making	,836	
Taking the initiative	,827	
Conflict resolution	,771	
Motivation	,722	
Improvement and advancement of knowledge	,654	
Leadership	,604	
Innovation and flexibility	,602	,364
Team cooperation	,599	
Training and development of employees	,487	
Effectiveness of strategic decisions		,921
Change management		,920
Innovative and research activities		,863
Greater market share		,836
Improving business competitiveness		,825
Improving the quality of business		,814
Strategic planning		,804
Quality of vision and mission		,755
Strategic decision-making		,754
Communication	,399	,525

Source: original research by the authors

Note: Kaiser+Mayer-Olkin (KMO) statistic = 0.950, Bartlett's Test of Sphericity= 9370.611, df=253, p=0.000

The results of the factor analysis indicate that the first component gathered factors related to the activities and characteristics of managers. The second component gathered factors related to strategic action. Variables that are present in both component 1 and component 2 are innovation and flexibility and communications (Table 7).

By being present in both components, they showed their importance and contribution as factors of a successful manager and the establishment of a favorable organizational climate. In addition, they have proven to be factors that play a key role in

defining and implementing the organization's strategic actions. Between components 1 and 2 there is a high correlation r = 0.756, which shows the essential connection between the mentioned factors. This indicates the great influence that the activities and characteristics of managers have on the strategic operation of the organization, above all on its effective implementation. The effectiveness of strategic action contributes to the improvement of the organization's operations, which affects the achievement of better results. This creates the conditions for gaining a greater competitive advantage and improving the organization's market position.

Discussion of results

The results obtained can likewise be understood within the framework of sports organizations, where strategic initiatives and managerial skills are essential for attaining success in both athletic and commercial domains. In contemporary sports structures, the efficacy of leadership, communication, and the motivation of personnel (which encompasses athletes and support staff) has a direct impact on performance results, the reputation of the organization, and its sustainability over the long term.

The assessment of the value of the analyzed variables of strategic action shows that in the analyzed companies there is a willingness of the management to invest in the effectiveness of strategic action, direction and thinking. What businesses, on the other hand, lack is greater incentive in the area of innovative and research activities. In addition, it is necessary for companies to adequately adopt the concept of change management and continuously implement it in their operations. The future course of action and survival of the company on the market will largely depend on the way of creation and the degree of adaptation to changes in the market. These results indicate that managerial practices do not only influence internal organizational efficiency, but also play a crucial role in shaping long-term strategic positioning and adaptability in highly competitive environments such as the sports industry.

The role of motivating and rewarding employees showed that there are statistically significant relationships of varying intensity between the variables of management activities and the variables of strategic action. The results obtained align with earlier research in strategic management and sports management, underscoring the significance of leadership, communication, and employee motivation as crucial factors influencing organizational performance. Comparable conclusions were drawn by Susanto et al. (2023) and Farid (2022), who noted that effective strategic management plays a vital role in enhancing organizational efficiency and competitiveness.

In the realm of sports organizations, these results are further corroborated by Milačić (2024), who stressed the necessity of strategic planning and management for attaining successful results within sports systems. The above relations prove the special hypothesis 2. Namely, it was confirmed that the variables of management activity and the variable of strategic action show statistically significant relations with the variables of strategic action of the organization with the moderating effect of motivation and rewarding of employees.

Companies that motivate their employees, adequately reward them and achieve effective communication achieve greater success in strategic planning and decision-making and defining the quality of the vision and mission. These findings are particularly relevant for sports organizations, where motivation and reward systems are essential for enhancing athlete performance, team cohesion, and organizational effectiveness. For instance, successful sports clubs often implement performance-based reward systems and motivational strategies to improve both individual and team results, which ultimately contributes to competitive advantage in leagues and tournaments. In addition, such companies achieve efficiency in implementing changes and create conditions for gaining a competitive advantage. On the contrary, those companies that do not invest enough effort to motivate their employees to work better, do not encourage efficiency in strategic decision-making and presentation of the company's vision and mission, do not have the conditions to achieve greater market share and gain a competitive advantage. All this further complicates the possibility of effective implementation of changes due to the lack of motivation of the workforce and insufficient awareness of what the change will bring.

The general hypothesis of this paper is also confirmed by the stated claims, established relationships and proven hypotheses. The results of the research confirm that increasing the efficiency of strategic action, and thus achieving better work results, can be ensured by improving the organizational climate of the organization and the role of managers with their ability, creativity and motivation. Thus, the objectives of the research presented in the paper have been fulfilled, and the set hypotheses have been proven.

However, this research has several limitations that should be considered. First, the study is based on data collected from companies operating in Serbia, which may limit the generalizability of the findings to other countries and industries, including global sports systems. Second, the use of a survey method may involve subjective bias of respondents. Third, the cross-sectional nature of the study does not allow for the analysis of changes over time. Future research should include longitudinal studies and more diverse samples in order to provide deeper insights.

Conclusion

The results of the original empirical research confirmed the influence of the manager's activities and characteristics on the achievement of more efficient and productive work, through the effective strategic action of the company. Correlation analysis established the existence of statistically significant relationships between activity variables and characteristics of managers and variables of strategic action. A significant connection was shown by the communication variable with the variables improving the quality and competitiveness of business, and the innovation and flexibility variable with the variables quality of vision and mission and strategic planning and decision-making.

A two-component solution was obtained by factor analysis, where the first factor brought together activity variables and manager characteristics, and the second factor included strategic action variables, and a high correlation was established between these two factors.

The stated relationships and established statistical relationships confirmed the special hypothesis 1. This hypothesis confirms that improving the management activities and organizational climate the organization improves the efficiency of strategic action. Variable characteristics of managers and variable strategic action show statistically significant relationships, which confirm the influence of characteristics of managers on the effectiveness of implementation of strategic decisions and adequate direction of the organization. Special hypothesis 2 is proved by these relations and assertions.

The aforementioned research identified characteristic management activities that have a great contribution in improving the efficiency of business and strategic actions of the organization. The research determined that the variables of activity and the characteristics of managers show a statistically significant connection with the variables of strategic action, which confirmed the set hypotheses and achieved the goal of the research. In order for a organization to successfully face changes in the market, managers must be ready to lead their employees through changes, to be able to take the initiative, but also responsibility in case of failure. Innovative and flexible business becomes an imperative of modern market conditions, and therefore this characteristic is very important for successful managers. The organization can achieve successful business, through a favorable organizational climate and by improving the abilities and skills of managers, and through the strategic actions of the organization.

Managers of companies from the territory of Serbia should base the improvement of business and competitiveness precisely on the improvement of activities and characteristics of managers, which this research determined to be crucial.

Moreover, the insufficient investment in innovation and change management, as highlighted in this study, can pose a considerable constraint for sports organizations. In the context of digital transformation, sports entities are required to embrace innovative strategies such as data analytics, digital fan engagement, and sophisticated performance tracking systems to maintain their competitiveness in the global sports sector. The findings of this study are relevant to sports organizations, as enhancing managerial practices and strategic initiatives can greatly improve both organizational effectiveness and competitive standing in the sports sector.

Imlications: The results of this research have important theoretical and practical implications. From a theoretical perspective, the study contributes to the literature by confirming the strong relationship between managerial activities, manager characteristics, and strategic action, particularly in dynamic sectors such as the sports industry. From a practical perspective, the findings suggest that managers should focus on improving communication, motivation, and reward systems, as well as fostering innovation and flexibility, in order to enhance organizational performance and achieve sustainable competitive advantage.

Conflict of interests:

The authors declare no conflict of interest.

Author Contributions:

Conceptualization - J.P., S.J.; Investigation - S.J., J.P.; Theoretical framerwork - J.P., S.D.; Datacuration - J.P., S.J.; Resources - S.J., J.P.; Writing original draft - S.J., J.P.; Writing - review & editing - S.D., J.P., S.J.

All authors have read and agreed to the published version of the manuscript.

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For entering equations and formulas, use Microsoft Equation Editor or the MathType add-in (www.mathtype.com). Avoid using the built-in Word 2007 equation editor. Ensure that all symbols in the equation are defined immediately after the equation.

References (citations) should be included directly in the text in the following format: (Petrović, 2012); (Petrović & Marković, 2012); or (Mirković et al., 2012). Do not use square brackets (e.g., [3]) or footnotes for citations. Use footnotes only for detailed explanations of specific terms or clarification of real or hypothetical situations. Do not number the pages.

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Table 5. Nike's distribution costs from production to retail stores

Indicators	Period			Total
	Month 1	Month 2	Month 3	
Distance crossed (km)	12.926	11.295	13.208	37.429
Fuel consumption (litre)	3.231	2.823	3.302	9.356
Value of fuel consumption ($).	242.378	211.790	247.653	701.821
Total time spend on touring (hour)	314	266	417	997
Value of total time spend on touring ($).	47.048	39.890	62.570	149.508
Number of tours	98	77	102	277
Toll value ($).	0	0	0	0
Number of pallets transported (piece)	1.179	976	1358	3.513
Total weight transported (kg)	602.600	429.225	711.116	1.742.941
Vehicle maintenance costs ($).	203.858	164.970	224.806	593.634
Lease costs ($).	480.938	454.214	565.784	1.500.936
Total sum ($).	974.222	870.864	1.100.813	2.945.899

Source: Milić, 2012;
Note: Values within the table are calculated without Value Added Tax (VAT)

Graphs, Dendrograms, Diagrams, Schemes, and Figures

Graphs, dendrograms, diagrams, schemes, and figures should be inserted directly into the text (do not use the Float over text option) and numbered according to their order of appearance. Their titles must be positioned immediately above the corresponding graphic element. When indicating the title, source, and notes, use the same formatting style as previously described for tables.

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Conclusion

When writing the conclusion, please note that although it may provide a concise overview of the main results, it should not simply repeat the abstract. The conclusion may explain the importance of the research, provide recommendations for practice, or suggest directions for future research on the discussed topic.

References

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Author Contributions

Conceptualization, V.A. and D.P.; Resources, V.A. and D.P.; Methodology, V.A.; Investigation, V.A. and D.P.; Data curation, V.A.; Formal Analysis, V.A. and D.P.; Writing – original draft, V.A. and D.P.; Writing – review & editing, V.A. All authors have read and agreed to the published version of the manuscript.

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