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naučni časopis iz oblasti sporta, medija i biznisa

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STRUCTURAL UPGRADING MEASUREMENT AND OPTIMIZATION PATH OF SPORTS INDUSTRY - AN EXAMINATION OF CHINA'S SOLUTION

Lu Kang ¹

Abstract: It is of great significance to explore the level of structural upgrading and optimization path of the sports industry to promote the transformation and development of the sports industry. Taking the structure of China's sports industry as the research object, a quantitative analysis method is adopted to construct a model for measuring the structural upgrading of China's sports industry, measuring the external structure of China's sports industry from 2006 to 2023 by the index of the proportion of the sports industry in the economic structure, and the direction and rate of the internal structural upgrading of China's sports industry from 2006 to 2023 by the coefficient of the overstepping forward of the industrial structure, the value of the change of Moore's structure and the value of the average change of the industrial structure. The direction and rate of upgrading the internal structure of China's sports industry from 2006 to 2023 are measured by the coefficient of industrial structure overrun, the value of Moore's structural change, and the average change value of industrial structure. The results show that: (1) the external structure of China's sports industry is continuously optimized, and its role in China's economic development is constantly emerging, but the contribution rate to economic growth is still relatively low; (2) the over-advanced development of the sports service industry, and the lagging development trend of the sports construction industry and the sporting goods manufacturing industry conform to the law of upgrading of the industrial structure; (3) from the internal viewpoint of the sports service industry, the sports management activities, the sports fitness and leisure activities, and the sports competition and performance activities are lagging. Sports management activities, sports fitness and leisure activities, and sports competition and performance activities are lagging, which has become one of the critical obstacles restricting the transformation and upgrading of China's sports industry. (4) From the perspective of the upgrading rate, there is ample space for structural changes in China's sports industry, and the upgrading rate is in an upward trend, especially in the emerging industries.

Keywords: transformation development; sports industry structure; upgrading measurement; optimization path

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Introduction

The global transition to a knowledge-driven economy is forcing various industries to undergo structural adjustments, and the sports industry, as a strategic area that integrates economic vitality, technological innovation, and social well-being, has attracted much attention in terms of its upgrading path. Against the backdrop of countries responding to the need for recovery and sustainable growth in the post-epidemic era, optimizing the industrial structure has become a key focus point for enhancing productivity, fostering innovation ecosystems, and aligning with the United Nations Sustainable Development Goals (SDGs). In this context, China's practice of promoting the modernization of the sports industry provides a valuable case study for examining the structural upgrading mechanism of transition economies. From the viewpoint of industrial structure theory, upgrading industrial structure promotes resource allocation, coordinates industrial division of labor, and drives economic development (Wang, 2018). The process of sports industry development is also the process of industrial structure adjustment and continuous improvement of innovation ability, shifting from resource-intensive and labor-intensive low-value-added industries to high-value-added high-tech industries and strategic emerging industries. The idea of claiming the speed and efficiency of economic development from the evolution of industrial structure is the core and essence of industrial development policy (Liu, 2000). After years of development, China's sports industry has entered a rapid development stage, with rapid growth in the scale and added value of the sports industry and continuous optimization of the industrial structure. Still, it faces structural problems, such as weak innovation ability, small total scale, unreasonable structure, and unbalanced regional development.

Some scholars have already determined through empirical research that economic structure conversion helps to promote the rapid development of the economy and believe that the measurement and judgment of the level of industrial structure adjustment will directly affect the decision-making and implementation process of the economic growth so the assessment of the effect of industrial upgrading and the promotion of structural conversion has become an essential path for the rapid development of the economy (Liu & Ling, 2020). Through the collection and collation of relevant literature on economic structure optimization and industrial structure upgrading, the research on industrial structure upgrading by scholars at home and abroad mainly focuses on the evaluation of the optimization effect (Cheng, Sun, & Bao, 2020), influencing factors (Yu & Shen, 2020; Lei & Cai, 2019), and the relationship with related systems (Zhu & Liu, 2020; Liu & Ling, 2020), and mainly focuses on quantitative research. There are three basic methods for industrial structure analysis: industrial structure correlation analysis method (e.g., structural similarity coefficient, Hoffman's ratio), in-

dustrial structure benefit analysis method (e.g., comparing labor productivity, rate of technological progress), and industrial structure change analysis method.

In terms of the analysis method of industrial structure change, some scholars have used the dynamic deviation-share method to study the industrial structure change; Fabricant (2009) used this method for the first time and utilized the decomposition formula to analyze the industrial structure effect; Paci et al. (1997) and Fagerberg et al. (1999) used this method to investigate the adjustment effect of industrial structure under the economic growth environment. Meanwhile, scholars at home and abroad have widely utilized Moore's structural change value, Lilien's index, and the average change value of industrial structure to determine the rate of industrial structure upgrading and the coefficient of overshoot to determine the direction of industrial structure upgrading. John H. Moore (1978) proposed Moore's structural change value to measure industrial structure change in 1978, and Robson (2006) used the Lilien index to analyze the change in industrial structure in each region of Britain. These several methods of industrial change analysis at home and abroad are more mature in their application system, with lower data requirements, simple operation, and strong interpretation, which are not only widely used in the analysis of the structural change of three industries (Liu & Ling, 2020), but also applicable to the research of transformation and upgrading of subdivided industries (Xu, Zhuang & Chu, 2019; Zhao, Yin & Ma, 2015), but the research of using these methods of industrial structure change analysis to measure the degree of structural change of the sports industry is still in the blank in the field of sports.

Specifically for the emerging sports industry, the number of research on industrial structure is rising. There are two main perspectives in the quantitative analysis of sports industry structure optimization. Hu Hongcheng (2012) and Yang Qian et al.(2011) earlier used grey correlation analysis to quantitatively analyze the optimization of China's industrial structure, and on this basis, An Junying et al. (2017) applied grey system theory to establish a GM (1, 1) prediction model to predict and analyze the structural changes in China's sports industry from 2016 to 2020, which provided the quantitative scientific basis for the dynamic evolution of the structure of the sports industry - Huang Haiyan (2011), Zhao Fuxue(2017), Yang Qian, etc. (2011) use location entropy, industrial structure diversification index, deviation-share analysis, comparative labor productivity, and other indicators to quantitatively analyze the basic situation of China's sports industry structure, through which the dynamic optimization process of China's sports industry structure can be observed. Secondly, it studies the relationship between the optimization of sports industry structure and related systems. Dai Tenghui et al. (2019) took the contribution rate and pulling rate of economic growth of the sports industry as the indexes and used quantitative analysis to explore the macroeconomic effect in the development of China's sports industry from the perspectives of total quantity and structure. In

general, the perspectives of measuring the structure of the sports industry include industry structure, investment structure, etc. There are internal and external structures from the analysis direction, and the quantitative analysis methods are also varied. In this paper, we will start from the industry structure, take the statistical data of each industry of China's sports industry from 2006 to 2023 as the support, and use the indexes such as the proportion of the added value of the sports industry to GDP to study the external structure of China's sports industry and draw on the three methods of analysis of changes in industry structure, namely, the coefficient of industrial structure overshooting, the value of changes in Moore's structure, and the value of average changes in the structure of the industry, which are used in the study of optimization of the economic structure, to measure The purpose is to propose an optimization path based on clarifying the structural level of China's sports industry.

Therefore, for the sports industry in its initial stage, how can we study the upgrading and optimization of the sports industry structure? How do we measure and evaluate the effectiveness of upgrading the previous sports industry structure? What problems exist in the structure of the Chinese sports industry? These are the questions that deserve our in-depth thinking. The innovation of this study is to scientifically observe the upgrading of the sports industry structure through 18 years of statistical data to provide a reference for other countries to examine the upgrading and transformation of their own sports industry.

Methods

External structure optimization index

The optimization of the structure of China's sports industry is reflected in the increasing proportion of the sports industry in the economic structure. This paper will use the proportion of the added value of the sports industry in GDP and the proportion of the added value of the sports service industry in the added value of the tertiary sector to measure the external structure of China's sports industry from 2006 to 2023.

Internal structural upgrading model

Coefficient of industrial structure overshooting

Industrial structure upgrading is evolving from lower form to higher form, and its direction has a certain regularity. The coefficient of industrial structure advancement can reflect the trend of industrial structure evolution and the degree of advancement and is calculated as follows.

$$Ei = ai + (ai - 1) / Rt \quad (1)$$

In the formula, the sports industry can be divided into n parts according to different criteria. Ei denotes the coefficient of structural overrun for industry i. ai represents the ratio of the share of industry i in the reporting period to the share in the base period. Rt denotes the average growth rate of the sports industry over the same period, calculated as $R_t = (\ln(GDP_{\text{报告期}}) - \ln(GDP_{\text{基期}})) / m$, m is the number of years, and GDP uses current prices. The base period Ei is 1; if Ei > 1, it indicates that the proportion of industry i tends to rise, and industrial development is ahead of schedule, the larger Ei is, the more significant the magnitude of ahead of schedule is; if Ei < 1, it indicates that the proportion of industry i tends to decrease, and industrial development is lagging, the smaller Ei is, the smaller the magnitude of lagging is.

Moore structural change values

Moore's structure change value determination model is based on the vector space ang. The sports industry is divided into n parts, and a set of n-dimensional vectors is constructed there. The angle between the two sets of vectors in 2 periods can be used as an indicator of the change industry's structure,y, i.e., the Moore value. The formula is as follows.

$$M = \cos \alpha = \sum_{i=1}^n (W_{i0} \times W_{it}) / (\sum_{i=1}^n W_{i0}^2 \times \sum_{i=1}^n W_{it}^2)^{1/2} \quad (2)$$

In the formula, M denotes the value of Moore's structural change, which is the cosine of the angle between the two vectors; W_{i0} denotes the share of industry i in the base period; W_{it} denotes the share of industry i in the reporting period. Therefore, the angle α between the two sets of vectors in the 2 time periods is: $\alpha = \arccos M$, the larger the value of α , the faster the change of industrial structure; the smaller α , the slower the change of industrial structure.

Average value of change in industry structure

The value of the average change in the industrial structure represents the absolute value of the change over a certain period of time and is calculated as follows.

$$k = \frac{\sum_{i=1}^n (|q_{it} - q_{i0}|)}{n} \quad (3)$$

In the formula, k is the average change in industrial structure; q_{it} is the proportion of the reporting period; q_{i0} is the proportion of the base period; n is the number of industrial categories; t is the number of years between the base period and the reporting period; the larger the value of k , the faster the change in industrial structure; the smaller the value of k , the slower the change in industrial structure.

Statistic

The data sources are the National Sports Industry Total Scale and Value Added Data Bulletin jointly issued by the General Administration of Sport of China and the National Bureau of Statistics of China, the International Sports Industry Development Report, and the China Statistical Yearbook, with a period of 2006-2023. It is worth noting that the current Chinese sports industry has adopted three classifications: the Classification of Sports and Related Industries (Trial) (2008), the National Statistical Classification of Sports Industry (2015), and the Statistical Classification of Sports Industry (2019). Compared with the classification system of 2008, the classification system of 2015 has changed a lot, not only stripping, adjusting, and adding two significant categories (sports competition and performance activities, sports media and information services) from the original classification system but also adjusting and changing the medium and small categories. Compared with the classification system of 2015, the classification system of 2019 has made adjustments to the relevant categories, descriptions, and corresponding industry codes to keep the original classification's basic structure unchanged, and the changes are relatively small. The statistical data of the sports industry in 2006-2014 are based on the classification system of 2008. The sports industry is divided into nine categories, which can correspond to the classification system of 2015, and the correspondence of these nine categories is shown in Table 1. The correspondence is shown in Table 1 (next page).

To ensure the continuity of analysis and consistency of presentation, this paper categorizes sports competition and performance activities and sports media and information services into sports management activities and other sports services, respectively, in 2015-2023, focusing on nine types of subsectors such as sports management activities, sports fitness and leisure activities, and sports venues and facilities and management, etc., and analyzes 2015-2023 separately. The two subsectors of sports competition and performance activities and sports media and information services are examined individually. They are based on the presentation of the subsectors in the Statistical Classification of the Sports Industry (2019).

Table 1. Correspondence of Statistical Classification of Sports Industries

Category	Sports and Related Industries Classification (Trial) (2008)	National Sports Industry Statistical Classification (2015)	Sports Industry Statistical Classification (2019)
Sports Service Industry	Sports Organization and Management Activities	Sports Management Activities	Sports Management Activities
		<i>Sports Competition and Performance Activities</i>	<i>Sports Competition and Performance Activities</i>
	Sports Fitness and Leisure Activities	Sports Fitness and Leisure Activities	Sports Fitness and Leisure Activities
	Sports Venue Management Activities	Sports Venue Services	Management of Sports Facilities and Facilities
	Sports Intermediary Activities	Sports Intermediary Services	Sports Agency and Representation, Advertising and Exhibition, Performance and Design Services
	Sports Training Activities	Sports Training and Education	Sports Education and Training
Sports Goods Manufacturing Industry	Other Sports Activities	<i>Sports Media and Information Services</i>	<i>Sports Media and Information Services</i>
		Other Sports-Related Services	Other Sports Services
	Sales of Sports Goods, Clothing, Footwear, and Headwear	Sales of Sports Goods and Related Products, Trade Agency and Rental	Sales of Sports Goods and Related Products, Rental and Trade Agency
	Manufacture of Sports Goods, Clothing, Footwear, and Headwear	Manufacture of Sports Goods and Related Products	Manufacture of Sports Goods and Related Products
Sports Construction Industry	Construction of Sports Venues and Facilities	Construction of Sports Venues and Facilities	Construction of Sports Venues and Facilities

Results

External structure optimization measurement

Based on the statistical data of China's sports industry from 2006 to 2023, the proportion of the added value of China's sports industry to GDP and the proportion of the added value of the sports service industry to the added value of the tertiary industry was calculated, and the results of the calculation are shown in Table 2. The data show that from 2006 to 2023, the added value of China's sports industry has increased from 98.289 billion yuan to 149.15 billion yuan, with an average annual growth rate of 17.70%, and the proportion of the sports industry in GDP grows from 0.47% to 1.18%. Meanwhile, the added value of China's sports service industry grows from 24.46 billion

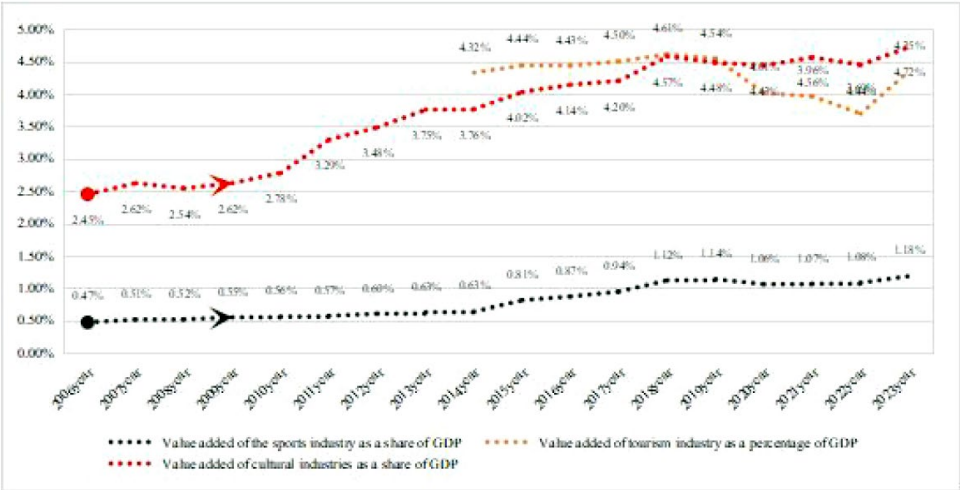
yuan in 2006 to 1084.6 billion yuan in 2023, with an average annual growth rate of 26.53%, and the added value of the sports industry service industry accounts for the proportion of tertiary industry added value grows from 0.30% to 1.58%. Over the past 18 years, the external structure of China's sports industry has been continuously optimized, and its role in China's economic development has constantly been revealed.

Table 2. The Share of China's Sports Industry in the Structure of the Economy, 2006-2023

Share of sports industry in economic structure (year)	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Share of added value of sports industry in GDP (%)	0.47	0.51	0.52	0.55	0.56	0.57	0.60	0.63	0.63	0.81	0.87	0.94	1.12	1.14	1.06	1.07	1.08	1.18
Share of added value of sports service industry in tertiary industry (%)	0.30	0.33	0.35	0.37	0.38	0.44	0.46	0.46	0.44	0.79	0.93	1.33	1.39	1.43	1.33	1.40	1.44	1.58

To grasp the external structure of the sports industry more clearly, this paper chooses the tourism and culture industries as references. It makes a horizontal comparison of the external structure of the three industries, and the comparison results are shown in Figure 1. Internationally, the industries that have a pivotal position in the development of the national economy account for more than 4% of the national economy in terms of added value, contribute significantly to the growth of the national economy, conform to the direction of the evolution of the industrial structure, are conducive to the optimization of the industrial structure, have a strong correlation, and can drive the development of many related industries are called the pillar industries (Liu, 2019). As shown in Figure 1, the tourism and culture industries became the pillar industries of the national economy around 2014 and 2015, while the value added by the sports industry accounted for only 0.63% of the GDP in 2014. The value added by the sports industry accounted for a significant increase in the proportion of GDP after 2014, and it will be 1.18% by 2023. Relevant information shows that the proportion of added value of sports industry to GDP in Germany was 3.9% in 2012, the proportion of added value of sports industry to GDP in the United States was 3% in 2015, and the proportion of added value of sports industry to nGDP in South Korea reached 4.3% in 2017 (Huang, 2020). After the above comparative analysis, it can be found that China's sports industry is still in the early stage of development, the external structure is not very reasonable, and the proportion of sports industry in the national economy and the contribution rate of the sports industry to economic growth is still relatively low.

Fig. 1. Comparison of the external structure of the sports industry with the tourism industry and the cultural industry



Note: Tourism industry 2006-2013 statistics are missing.

Internal structure optimization measurement

(1) Direction of industrial structure upgrading of the three major industries

Based on the statistical data of China's sports industry from 2006 to 2023, combined with formula (1), we calculate the change value of the proportion of the three major industries in China's sports industry as well as the coefficient of overshooting to reflect the direction of structural upgrading of the sports industry. To compare the changes in the structure of the sports industry in different periods, taking the introduction time of the National Statistical Classification of the Sports Industry (2015) as the node, the development cycle of China's sports industry is divided into two time periods, T1=2006-2014 and T2=2015-2023, and the overrun coefficients of the two time periods are calculated respectively. The results of the calculations are shown in Table 3. Industries are 47.80, -46.04, and -1.77, respectively, and the overrun coefficients are 15.64, 4.61, and 3.95. The overall proportion of the sports service industry as a whole is on the rise, and the industry is overrunning; the proportion of the sporting goods manufacturing industry and the sports construction industry as a whole is on the decline, and the overrun coefficients are <1, and the industry is lagging. From 2006 to 2014, the sports service and construction industries were overdeveloped, with overdevelopment coefficients of 3.57 and 1.02, respectively, and the sporting goods manufacturing industry lagged, with an overdevelopment coefficient of <1, at 0.11. From 2015 to 2023, the

overdevelopment coefficient of the sports service industry is 5.78, the overdevelopment coefficient of the sports construction industry rises to 17.69, and the overdevelopment coefficient of the sporting goods manufacturing industry In general, the coexistence of sports service industry's over-advanced development, sports construction industry and sporting goods manufacturing industry's lagging development is in line with the law of industrial structure upgrading. However, China still needs to focus on the transformation and development of the sporting goods manufacturing industry and the sports construction industry, utilize technological innovation to explore the growth point of the sporting goods manufacturing industry and the sports construction industry, and, at the same time, ensure the efficient, reasonable and rapid development of the sports service industry.

Table 3. Changes in the proportion of the three major industries in China's sports industry and the coefficient of overshooting

time period	Value of change in the share of three major industries			Three industry override factors		
	Sports Service Industry	Sports Goods Manufacturing Industry	Sports Construction Industry	Sports Service Industry	Sports Goods Manufacturing Industry	Sports Construction Industry
	Industry	Industry	Industry	Industry	Industry	Industry
T ₁ =2006-2014year	8.70	-8.71	0.01	3.57	0.11	1.02
T ₂ =2015-2023year	23.50	-24.50	1.00	5.78	-3.89	17.69
T=2006-2023year	47.80	-46.04	-1.77	15.64	4.61	3.95

(2) The direction of upgrading the industrial structure of the sports service industry

As we all know, the development of the sports service industry plays an irreplaceable role in the structural upgrading and high-quality development of the sports industry. Therefore, this paper utilizes the 2006-2023 sports industry statistics to calculate the industry structure overrun coefficients of seven sectors of China's sports industry service industry from 2006 to 2023 and utilizes the 2015-2023 statistics to estimate the overrun coefficients of the two subsectors, namely, sports competition and performance activities, and sports media and information services. The results of the calculations are shown in Tables 4 and 5, respectively.

Table 4. Coefficient of overshooting of industrial structure within China's sports service industry

Sports Service Industry (1)	T ₁ =2006-2014year		T ₂ =2015-2023year		T=2006-2023year	
	Specific	Overrun	Specific	Overrun	Specific	Overrun
	gravity change value	factor	gravity change value	factor	gravity change value	factor
Sports Management Activities	-0.82	-0.09	3.50	9.44	-1.01	0.24
Sports Fitness and Leisure Activities	1.12	3.38	6.80	22.19	-4.42	6.31
Management of Sports Facilities and Facilities	-0.14	0.25	0.30	1.27	6.74	21.88
Sports Agency and Representation, Advertising and Exhibition, Performance and Design Services	0.51	26.37	1.30	33.40	1.39	39.99
Sports Education and Training	3.09	67.53	11.80	26.21	14.83	181.50
Other Sports Services	1.31	7.09	7.00	17.36	8.02	22.09
Sales of Sports Goods and Related Products, Rental and Trade Agency	3.63	5.74	-7.20	-0.90	13.42	10.92

Table 5. Structural Overrun Coefficient of Sports Competition and Performance Activities, Sports Media and Information Services Industries

Industry	Specific gravity change value	Overrun factor
Sports Competition and Performance Activities	1	8.48
Sports Media and Information Services	2.70	29.84

The data in Tables 4 and 5 reflect that the overrun coefficient of sports management activities and stadium services is less than 1 in 2006-2014, which is a lagging development. At the same time, sports education and training, sports brokerage and agency, advertising and exhibition, and performance and design services were overdeveloped. Overall, the internal structure of China's sports service industry from 2006 to 2014 was unreasonable, and the core principal industry of the sports industry was in a state of lagging development. From 2015 to 2023, the sports media and information service industry has overdeveloped since its separation from other sports services in 2015, with an overdevelopment coefficient of 29.84, and the sports competition and performance activities industry has overdeveloped, with an overdevelopment coefficient of 8.48. Sporting goods and related products sales, trade agency, and rental are lagging, with an overrun coefficient of -0.90. Sports brokerage and agency, advertising and exhibition, performance and design services, sports education and training, sports fitness and leisure activities, and other sports services are overrunning, with overrun coeffi-

cients of 33.40, 26.21, 22.19, and 17.36, respectively. This indicates that the National Statistical Classification of the Sports Industry (2015), the structure of the sports industry has been optimized to a certain extent since then, and the higher value-added sports management activities, sports fitness, and leisure activities have turned from lagging development to overdevelopment from 2006-2014.

Enlarging the period of observing the structure of China's sports industry from 2006 to 2023, the development trend of various subsectors of China's sports service industry shows different development trends. Although the sports service industry, in general, is ahead of its time, its internal structure is not reasonable. Sports management activities, fitness and recreational activities, and sports competitions and performances, which are of good benefits and high added values, should have been ahead of their time. Still, they have shown obvious lagging development compared with other sports service industries, which is unreasonable. However, compared with other sports service industries, they are lagging, which is absurd. The coefficients of sports management activities and sports fitness and leisure activities are 0.24 and 6.31, respectively, lagging behind the development of other industries. In sharp contrast, the sports education and training industry, with a forward coefficient of 181.50, is developing ahead of schedule by a considerable margin, which indicates that the sports education and training industry is growing faster in optimizing and upgrading the structure of China's sports industry. In addition, the coefficients of sports brokerage and agency, advertising and exhibition, performance and design services, stadium services, other sports services, and the sales, trade agency, and rental of sporting goods and related products are 39.99, 21.88, 22.09, and 10.92 respectively, indicating that these industries are also ahead of their time.

(3) Structural upgrading rate of China's sports industry

This paper examines the rate of structural change in China's sports industry. It determines the rate of transformation of the sports industry through the value of Moore's structural change, the average change of industrial structure, i.e., the value, and the value. Using the statistical data of China's sports industry from 2006 to 2023, combined with the two mathematical formulas of (2)(3), the Moore structural change value, the vector pinch angle, the average annual change value of the vector pinch angle, and the average annual change value of the industrial structure for the upgrading of the three major industries of China's sports industry, the subsectors, and the emerging industries in 2006-2014, 2015-2023, and 2006-2023, respectively, are computed values, to more accurately reflect the rate of structural upgrading of China's sports industry. The calculation results are shown in Table 6.

Table 6. Speed of Industrial Transformation and Upgrading of China's Sports Industry by Category, 2006-2018

classification			T ₁ =2006-2014year	T ₂ =2015-2023year	T=2006-2023year
three main industries	Moore Numeric		0.16	0.83	0.90
		Vector angle in degrees	8.91	47.56	51.39
		Average annual change in vector angle (degrees)	1.11	2.80	3.02
		Average annual change value of industrial structure (%)	0.06	0.16	0.32
niche industry	Moore Numeric		0.96	0.84	0.79
		Vector angle in degrees	16.79	32.53	37.73
		Average annual change in vector angle (degrees)	2.10	1.91	2.22
		Average annual change value of industrial structure (%)	0.02	0.05	0.07
emerging industry	Moore Numeric		1.00	0.84	0.91
		Vector angle in degrees	4.48	32.53	24.01
		Average annual change in vector angle (degrees)	0.56	1.91	1.41
		Average annual change value of industrial structure (%)	0.01	0.02	0.03

From 2006 to 2023, the overall development trend of China's sports industry's three major industries, subsectors, and emerging industries is accelerating. (1) The three major industries. 2006-2023, the average annual change value of the industrial structure of China's three major industries is 0.32%, the vector pinch angle is 51.39°, and the average yearly change value of the vector pinch angle reaches 3.02°. The structure of the sports industry as a whole is at a high level. Among them, the change in the structure of the sports industry in 2015-2023 is significantly faster than that in 2006-2014, and the average annual change value of the vector clamp angle and the average annual change value of the industry structure reached 2.52 and 2.67 times of the average change value in 2006-2014. (2) Segmented industries. From 2006-2023, the average annual change value of the industry structure of segmented industries in China is 0.07%, the vector pinch angle is 37.73°, and the average yearly change value of the vector pinch angle reaches 2.22°. The change in the structure of the sports industry is slower than that of the three major industries. Similarly, the structural change of the sports industry in 2015-2023 is less pronounced compared with 2006-2014. (3) Emerging industries. From 2006 to 2023, the average annual change value of the industrial structure of China's emerging industries is 0.03%, the average yearly change value of the vector pinch angle is 24.01°, and the average annual change value of the vector pinch angle is 1.41°, and the structural change of the sports industry is significantly slower than that of the three major industries and subsectors. However, similarly, the structure of the sports industry changes slightly faster than in 2006-2014 and

2015-2023. It can be seen that the industrial structure change of emerging industries is more significant, which indicates that the space for upgrading the industrial structure of emerging industries is expanding. In general, 2014 was a watershed in the structural change of China's sports industry, and the change in industrial structure accelerated after 2014, which also gradually tends to be reasonable. This is closely related to the State Council's issuance of Several Opinions on Accelerating the Development of the Sports Industry and Promoting Sports Consumption in 2014, which is also known as the "first year" of the development of the sports industry by relevant experts. This year, the development of China's sports industry also entered the fast lane. After this year, the national statistical classification of the sports industry was updated and adjusted in 2015. Some fast-developing emerging industries, such as the sports competition and performance industry, sports media, and information services, were included and divested, one of the reasons for the significant structural change of the sports industry from 2015 to 2023. It can be seen that the structure of China's sports industry has ample space for change, and the rate of upgrading is in an upward trend. Although the structure of China's sports industry is not reasonable, it is still in the process of accelerated optimization and adjustment.

Discussion

The external structure of China's sports industry is not reasonable enough, which is mainly reflected in the proportion of the sports industry in the national economy and the low contribution rate of the sports industry to economic growth. From the data, the proportion of the added value of the sports industry to GDP and the proportion of the sports service industry to the tertiary industry from 2006 to 2023 has shown remarkable and rapid growth. However, horizontally, there is still a big gap between it and the external structure of the tourism industry, culture industry, and sports industry in developed countries, and the rapid development of tourism and culture has boosted consumption growth and promoted the upgrading of consumption. The economic benefits of the sports industry have not been given full play to send out; that is to say, the current scale of China's sports industry is still relatively low; the main reasons are: First, the core of the sports body industry development is backward. Currently, the added value of the competition and performance industry and the fitness and leisure industry only accounts for 11.20% of the added value of the sports industry, which is not worthy of its core status. Secondly, the adequate supply is insufficient. The sports industry is underdeveloped, and the supply of exceptional venues and guidance services for popular sports such as soccer, basketball, and tennis is inadequate to meet the diversified sports needs of various sports fans. Third, the effective demand is not strong (Li et al., 2019. It is manifested in

the insufficient demand for ornamental and participatory sports consumption, while the demand for physical sports consumption accounts for a high proportion of the demand (Ren & Huang, 2020); secondly, the consumption consciousness is weak, and sports and healthy lifestyles have not yet become an integral part of lifestyle consumption, and the residents' sports consumption consciousness is not strong.

The overall trend of structural upgrading in China's sports industry is in line with the law of industrial structural upgrading, and the speed of change has accelerated. Still, the level of internal structural upgrading is not high. First of all, the proportion of the sporting goods manufacturing industry in the structure of China's sports industry has been persistently high for a long time, and the proportion of the sports service industry is relatively low. The proportion of the sports service industry exceeded the sporting goods manufacturing industry for the first time in 2015, reaching 55.51%, but it was only 33.59% in 2013; the proportion of the sports service industry has improved to a certain extent, but the long-term structural problems have not been substantially improved (Chen, 2019).

Secondly, the sports service industry is generally overdeveloped, but the internal structure of the sports service industry is not reasonable; it is still in a relatively low-end state, and the level of development of the sports service industry is not sufficient. Specifically, it is manifested in the following: sports management activities with good benefits and high added value, sports fitness and leisure activities, and sports competitions and performances show obvious lagging development, and the supply of medium and high-end sports services is insufficient. Finally, the sporting goods manufacturing industry is under more significant pressure for transformation and upgrading. After years of development, China's sporting goods manufacturing industry has developed more maturely. Still, due to the long-term reliance on production factor drive, there are problems such as more low-end and medium-end products, low product quality, a high degree of homogenization, and fewer brand-oriented enterprises. In general, the speed of internal structural upgrading of China's sports industry is accelerating, and the direction is constantly being adjusted, but the level of upgrading is not high.

Conclusion

The kernel of the high-quality development of the sports industry is the optimization and upgrading of the structure of the sports industry. Through the model measurement, the following conclusions are drawn: the external structure of China's sports industry is continuously optimized, and its role in China's economic development is constantly emerging, but the contribution rate to economic growth is still relatively

low; the overdevelopment of the sports service industry, the lagging development of the sports construction industry and the sporting goods manufacturing industry are basically in line with the law of upgrading of the industrial structure; from the internal point of view of the sports service industry, sports education and training, sports media and information services, sports brokerage and agency, advertising and exhibition, performance and design services, stadium services, other sports services, sporting goods and related products. From within the sports service industry, sports education and training, sports media and information services, sports brokerage and agency, advertising and exhibition, performance and design services, stadium services, other sports services, sales, trade agency, and rental of sports goods and related products are developing ahead of time. Still, sports management activities, sports fitness and leisure activities, and sports competition and performance activities are lagging, which is one of the critical obstacles restricting the transformation and upgrading of the sports industry. Regarding the upgrading rate, China's sports industry has ample space for structural change, and the upgrading rate is on an upward trend, especially in emerging industries.

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IMPACT OF MOTORIC ACHIEVEMENT AND DIETARY HABITS ON STUDENTS' CARDIOVASCULAR ENDURANCE

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Abstract: The aim of this study was to identify achievements in motor tests and dietary habits as predictors of cardiovascular endurance among Medical rehabilitation students. The sample included 159 Medical rehabilitation students from Novi Sad, Serbia (37 males, 122 females) who attended physical education classes twice a week. The battery of tests from the applicable protocol and dietary questionnaire was used. The exploratory factor analysis and multiple linear regression were applied. The multiple regression analysis determined a statistically significant relationship between specific motor tests and the Shuttle Run Test ($R=0.828$, $p=0.000$), but no significant differences between the factors obtained for dietary and the Shuttle Run Test. The findings highlight the importance of tailored exercise and nutrition plans and education on healthy lifestyles and emphasize the need for further research to support overall health.

Keywords: motor skills, dietary habits, cardiovascular endurance, students

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Introduction

In the past decades, increased attention has been given to physical activity, an element of a healthy lifestyle, as an essential factor in maintaining and improving health. Physical activity represents any body movement that increases human energy expenditure, such as walking in the park, climbing stairs, carrying groceries from the store to home, and even professional sports disciplines like running, weightlifting, etc. (Bouchard et al., 2012; Hoffman, 2009; Rani, 2021). Physical activity contributes to the improvement of quality of life, as well as the reduction of cardiovascular morbidity and mortality (Dhuli et al., 2022). Regular physical activity offers numerous benefits, such as improving motor skills, maintaining a healthy body weight, and enhancing overall health, including lowering the risk of heart disease and depression. (Bouchard et al., 2012).

Structured physical activity is not just about exercise; it is about refining motor skills, encompassing a wide range of characteristics related to body performance. This knowledge is essential for overall health and well-being. Motor skills such as muscular endurance, muscular strength, cardiorespiratory endurance, flexibility, and explosive strength are key elements for a healthier lifestyle (Colella et al., 2023; Rinne et al., 2010; Wrotnjak et al., 2006).

There are two types of muscular endurance: aerobic (cardiovascular) and anaerobic. Aerobic exercise consists of various exercises and physical activities that stimulate the heart and lungs long enough to benefit the body (Dayananda et al., 2024). Aerobic physical activities include running, walking, hiking, skating, cycling, and swimming. These exercises require continuous and rhythmic body movements that involve and activate large body muscle groups (Dayananda et al., 2024). Therefore, this type of activity contributes to increased maximum breathing capacity and heart rate, thus positively impacting the improvement of the cardiovascular system (Reiss, Stricker, 2013). In childhood and adolescence, cardiorespiratory endurance is inversely related to physiological risk factors for chronic diseases, such as high blood pressure, hyperglycemia, obesity, atherogenic lipid profiles, insulin resistance, hemostatic and inflammatory markers, and clustering of metabolic risk factors (Pate et al., 2006).

Anaerobic physical activities require short, explosive muscle efforts that quickly deplete energy reserves. Some examples of anaerobic physical activity include strength training (such as weightlifting or bodyweight exercises like pull-ups and push-ups), high-intensity interval training (HIIT), quick sprints, and explosive sports such as boxing, javelin throw, discus throw, and jumps (Hill, Kupalov, 1929). Anaerobic endu-

rance is associated with all activities performed at maximum or sub-maximum intensity (Stojanović, 2014).

Muscular strength is the motor ability to overcome internal and external forces with human muscle force (Suchomel et al., 2016). Muscular endurance refers to the motor ability to perform a specific movement for an extended period without reducing efficiency, or rather the ability to maintain activity at a consistent intensity over time (de la Motte, 2017). The movement speed built on strength defines explosive muscle effort, determined by the size of the overcome resistance (Peterson et al., 2006). Explosive strength is crucial in fast sports disciplines like sprinting, jumping, and throwing (Haff et al., 2001). However, it is significant in everyday activities such as lifting heavy objects or instantly accelerating while walking or running.

In today's sedentary lifestyle, it is necessary to maintain and improve flexibility. Reducing the risk of back problems, joint issues, and other musculoskeletal disorders is becoming increasingly important. This awareness is crucial in our modern, often desk-bound, lives (Van Roy, Borms, 2008).

Dietary habits are subject to numerous changes and are influenced by various factors, such as fast food, processed products, high intake of refined carbohydrates, insufficient consumption of fruits and vegetables, and increased consumption of processed meat products, cigarettes, alcohol, sugar-sweetened beverages, which have become trends in nutrition that accompany modern lifestyles (Insel, 2014). As a consequence of an unhealthy lifestyle, obesity has become a leading global health issue in recent decades (Caprio et al., 2020). It has long been identified as an aesthetic rather than a health problem. Research has shown that obesity is on the rise, not only in developed Western countries but also in fewer developing countries, where underweight is also present (Poskitt et al., 2009). Obese children have a higher risk of developing cardiovascular diseases in adulthood compared to their normal-weight peers. Obesity negatively affects daily activities and decreases the quality of life (Vaccaro, Huffman, 2016). Poor fruit and vegetable intake, insufficient physical activity, and increased screen time appear worldwide (Vaccaro, Huffman, 2016).

Physical activity positively impacts an individual's health and well-being, contributing to developing or maintaining physical abilities. The aim of this study is to identify achievements in motor tests (Standing Long Jump, Grip Strength Test, Sit and Reach Test, Sit-ups for 60 seconds, Push-ups, Shuttle Run Test) and dietary habits as predictors of cardiovascular endurance among students related to Basic and Additional Nutrition (the two-factor structure of dietary habits among Medical rehabilitation students).

Methods

The current research, a comprehensive empirical cross-sectional study, delved into the cardiovascular endurance of Medical rehabilitation students from Novi Sad, Serbia. This central outcome variable was intricately related to a set of predictor variables, meticulously examining these students' motor achievements and dietary habits. The other outcome variable, the results of the Shuttle Run Test, was also thoroughly investigated. The predictor variables included dietary-related behaviors and motor test achievements: Standing Long Jump, Grip Strength Test, Sit-ups for 60 seconds, Sit-and-Reach Test, and Push-ups.

The empirical part of the study was conducted with utmost adherence to the applicable protocol of the System for Monitoring the Physical Growth and Development of Student Motor Skills in Physical Education and Health Classes, along with a dietary questionnaire constructed by the authors. Ethical considerations were paramount, with training provided for the examiners and the initial sample of respondents carefully defined. The sample, consisting of first-, second-, and third-year Medical rehabilitation students at the University of Novi Sad who attended physical education classes twice a week, was selected with the highest ethical standards. The Declaration of Helsinki further bolstered the integrity of this study, and all procedures involving research study participants were approved by each participant voluntarily providing written informed consent before participating.

Standing Long Jump

The test evaluates the explosive strength of the lower extremities. The participant stands behind feet aligned with shoulder-width. In this position, the participant must bend their knees, swing their arms, push off firmly, and jump as far as possible. The participant should land on both feet and maintain an upright body position. Three attempts should be made, and the best result is recorded (Milanović et al., 2019).

Sit-ups for 60 Seconds

Sit-ups assess the trunk's muscular endurance and strength. The participant starts lying on their back on a mat with knees bent at 90°, feet aligned with hip-width, and arms crossed over their chest with palms on opposite shoulders. The examiner holds the participant's feet to the ground. At the start signal, the participant lifts their torso into a sitting position as quickly as possible, ensuring that their elbows touch their thighs before lying back down. This lifting and returning to the starting position

should be performed as fast as possible for 60 seconds. The result is the total number of correctly performed sit-ups (Milanović et al., 2019).

Grip Strength Test

This test measures the isometric strength of the upper body. The participant squeezes the grip for at least two seconds continuously, performing the test twice alternately. The participant determines the optimal range, and a short rest is allowed between measurements. For each measurement, the first tested hand is chosen randomly. The elbow must be fully extended, and the dynamometer should not touch any body part except the hand being measured. Both hands are measured twice, and all results are recorded. The best attempt for each hand is taken (in kg, with a precision of 0.5 kg) (Milanović et al., 2019).

Sit-and-Reach Test

Sit-and-Reach test assesses flexibility. The participant sits on the floor with both legs extended. The hands are extended, with palms next to each other. The participant must perform a deep forward bend and push the ruler as far as possible with their middle fingers without swinging or rocking. The legs must remain fully extended during the task. The task is repeated three times, and all three results are recorded. The result is the reach distance in centimeters (Milanović et al., 2019).

Push-Ups

This test evaluates the muscular strength and endurance of the upper body. Men perform the test from a standard starting position (hands extended directly beneath the shoulders, back straight, head aligned with the spine, and toes on the floor), while women start in a kneeling position (legs together and crossed at the ankles, with the lower part of the foot resting on the floor in a plantar flexion position, back straight, hands aligned with shoulder-width, and knees as the support). The participant lowers their body until their chin touches the ground and then raises it by extending the elbows. The stomach should not touch the floor. Throughout the protocol, both men and women must keep their backs straight and push to an extended elbow position. The result is the number of performed push-ups without breaks between repetitions. The test ends if the participant strains too much or disrupts the execution technique in two consecutive repetitions (Ostojić, 2023).

Shuttle Run Test

The test evaluates aerobic capacity and cardiorespiratory endurance by requiring participants to run between two lines, 20 meters apart, at a pace dictated by an audio signal from a CD. The participant must have both feet across the line at each audio signal. The test is designed to push the participant's limits, starting at a speed of 8.5 km/h (20 meters in 9 seconds) and increasing by 0.5 km/h every minute. The goal of the test is to run as many laps as possible, with the test ends when the participant can no longer keep up with the required pace or when they fail to cross the line three times in a row when the sound signal is heard. Each level contains a certain number of segments (Milanović et al., 2019).

Dietary Questionnaire

For the exploratory factor analysis, the part of the survey with answers "always," "often," "sometimes," and "never" were taken, which are as follows:

- Do you eat breakfast?
- Do you have breakfast, lunch, and dinner?
- Do you eat at least 200g of vegetables every day?
- Do you drink at least 1-1.5 liters of water every day?
- Do you eat at least 200g of fruit every day?
- Do you have dessert with your meals?
- Do you drink wine/beer during meals?
- Do you drink at least two glasses of milk or yogurt every day?

Statistical data analysis was conducted using the IBM SPSS Statistics 20 software. Descriptive statistics parameters were calculated for the obtained data, providing practical insights for future research. Exploratory factor analysis was applied to discover the factor structure of the dietary habits of medical rehabilitation students, offering practical implications for dietary interventions that generated the following factors: Basic Nutrition and Additional Nutrition. Multiple linear regression was used to estimate the relationship between achievements in motor skills tests (Standing Long Jump, Grip Strength Test, Sit-ups for 60 seconds, Sit-and-Reach Test, and Push-ups) and dietary habits with the results of the Shuttle Run Test, providing potential for inspiring future studies on improving cardiovascular endurance.

Results

The characteristics of the sample were presented (Table 1), as were the results of the exploratory factor analysis (Tables 2 and 3), and an overview of the relationships between motor test performance, dietary habits, and the cardiovascular endurance of Medical rehabilitation students (Table 4).

Table 1. General sample characteristics

	Grade	N (%)
Male	First-year	6 (3.8)
	Second-year	15 (9.4)
	Third-year	16 (10.1)
	Total	37 (23.3)
Female	First-year	42 (26.4)
	Second-year	16 (10.1)
	Third-year	28 (17.6)
	Total	122(76.7)

Note: N-number

The exploratory factor analysis of dietary habits

The exploratory factor analysis was applied to verify the factor structure of dietary habits among Medical rehabilitation students. Conforming to the items with multiple-choice responses (always, often, sometimes, and never), the exploratory factor analysis was conducted. The data were exposed to parallel factor analysis to determine significant factors, and results obtained along the Guttman-Kaiser criterion for factor extraction were also presented.

The data were suitable for correlation ($p=0.000$), as determined by the KMO test of sphericity. The commonalities reflect the common variance in the data structure after the factors were extracted.

According to the Guttman-Kaiser criterion, four characteristic eigenvalues had values higher than 1 (Table 2), and according to parallel factor analysis, two characteristic eigenvalues explain a higher percentage of variance than their random counterparts at the 95th percentile criterion (Table 3).

Table 2. The Guttman-Kaiser criterion for factor extraction

	Eigenvalue	Proportion of Variance	Cumulative Proportion of Variance
Do you eat breakfast?	1.879	23.490	23.490
Do you eat at least 200g of fruit every day?	1.458	18.223	41.713
Do you eat at least 200g of vegetables every day?	1.070	13.371	55.084
Do you have dessert with your meals?	1.023	12.782	67.866
Do you drink wine/beer during meals?	0.854	10.677	78.543
Do you have breakfast, lunch, and dinner?	0.695	8.683	87.226
Do you drink at least two glasses of milk or yogurt every day?	0.675	8.439	95.666
Do you drink at least 1-1.5 liters of water every day?	0.347	4.334	100.000

Table 3. The parallel factor analysis

	Real-data eigenvalues	Mean of random eigenvalues	95 percentile of random eigenvalues
Do you eat breakfast?	1.000000	1.346058	1.475605
Do you eat at least 200g of fruit every day?	2.000000	1.217473	1.308176
Do you eat at least 200g of vegetables every day?	3.000000	1.118236	1.173340
Do you have dessert with your meals?	4.000000	1.031669	1.085049
Do you drink wine/beer during meals?	5.000000	0.949412	1.007833
Do you have breakfast, lunch, and dinner?	6.000000	0.865738	0.920880
Do you drink at least two glasses of milk or yogurt every day?	7.000000	0.783545	0.848470
Do you drink at least 1-1.5 liters of water every day?	8.000000	0.687869	0.753916

After the parallel analysis, the exploratory factor analysis was repeated with a fixed number of factors for extraction (2). Based on the values of commonalities, the items "Do you drink beer/wine during meals?" and "Do you drink at least two glasses of milk every day?" were excluded. The values of these items were less than 0.30.

The generated factors from the parallel factor analysis were: 1. Basic Nutrition and 2. Additional Nutrition. The obtained two-factor model explains 53.715% of the variance, Basic Nutrition measures 30.221% of the variance, and Additional Nutrition

measures 23.493% of the variance. Geomin rotation was used, and the matrix pattern is shown in Table 2. The table shows only the statistically significant loadings at the 0.05 level, i.e., those with a value higher than 0.30.

The Basic Nutrition factor grouped the items "Do you eat breakfast" (0.886) and "Do you have breakfast, lunch, and dinner?" (0.830). Remarkably, these two items saturate the mentioned factor almost equally.

Multiple linear regression

The multiple regression analysis determined a statistically significant relationship between the set of predictors, results of the motor tests, and the Shuttle Run Test ($R=0.828$, $p=0.000$). Therefore, no statistically significant relationship between Basic and Additional Nutrition and the Shuttle Run Test appeared ($R=0.254$, $p=0.082$). The multiple correlation coefficient between the results of the motor tests and the Shuttle run test was 0.828. The set of predictors explained 6.8% of the variance in the outcome of the criterion variable. The predictors that influence the criterion variable are shown in Table 4.

Table 4. Multiple linear regression

Model	B.	S.E.	Beta	t	p	95.0%	CI for B
Standing Long Jump	0.190	0.052	0.414	3.654	0.000	0.087	0.294
Right Hand Grip	-0.261	0.255	-0.159	-1.024	0.309	-0.770	0.247
Left Hand Grip	0.441	0.255	0.259	1.729	0.088	-0.067	0.949
Sit and reach	0.053	0.145	0.026	0.363	0.717	-0.237	0.342
Push-ups	0.161	0.093	0.144	1.727	0.088	-0.025	0.348
Sit-ups for 60s	0.451	0.171	0.281	2.639	0.010	0.111	0.792

Note: B: estimate, S.E: standard error, CI: confidence interval, $p \leq 0.05$

The Standing Long Jump explained 0.5% of the criterion variable, while the Sit-ups explained 4.5%.

Discussion

The research was conducted to identify achievements in motor tests (Standing Long Jump, Grip Strength Test, Sit-ups for 60 seconds, Sit-and-Reach Test, and Push-ups) and dietary habits related to Basic and Additional Nutrition as predictors of cardio-vascular endurance in Medical rehabilitation students. The Shuttle Run Test evalua-

tes cardiovascular endurance. In addition, the relationships between the listed motor tests and the Shuttle Run Test, as well as dietary factors and the Shuttle Run Test, were examined.

The empirical part of the research was conducted at the beginning of the school year during physical education classes for Medical rehabilitation students. The sample consisted of first-year (30.2%), second-year (19.5%), and third-year students (27.8%) (76% female, 24% male).

The significant predictors in the set of motor tests were the Standing Long Jump and the Sit-ups for 60 seconds. In both cases, better test results led to better cardiovascular endurance, indicating that students with stronger trunk flexor muscles and better explosive strength of the lower extremities also had better cardiovascular endurance. The obtained results align with assumptions formed through previous pedagogical practice.

The results of the exploratory factor analysis of dietary habits showed that the structure of habits is significant for the diet of Medical rehabilitation students. However, the structure needed to confirm the well-known thesis that diet is crucial in maintaining health and cardiovascular endurance (Vitale & Getzin, 2019). Furthermore, the importance of physical activity and healthy nutrition for improving cardiovascular endurance and overall health (Bouchard et al., 2012; Petrović et al., 2010) also did not align with the results, as there is no statistically significant relationship between the set of dietary predictors and the Shuttle Run Test.

The results have multiple implications. First, educating students about healthy dietary habits and regular physical activity is also emphasized to improve physical fitness (Ostojić, 2023). Additionally, the results may help develop a modified physical exercise program and nutrition plan according to individual student needs.

This study presents several limitations that should be considered when interpreting the results. The research was conducted exclusively on Medical rehabilitation students from one university, limiting the generalizability of the findings to a broader student population or other educational contexts. The sample was predominantly female (76%), which could influence dietary and physical activity patterns, potentially skewing the results. The reliability of the Additional Nutrition factor was low, as indicated by a Cronbach's Alpha coefficient ranging from -0.132 to 0.449, which suggests that the four items used to assess this factor may not reliably measure the intended construct. As a cross-sectional study, causal relationships cannot be established. Longitudinal research would be required to explore how changes in motor skills or dietary habits affect cardiovascular endurance over time. The dietary habits were assessed through self-report, which can introduce biases such as social desi-

rability (participants may report what they think is socially acceptable) or inaccurate recall (participants may not accurately remember their dietary habits).

Despite the limitations, this study also has several notable strengths. The study's unique approach of combining physical fitness assessments with dietary habit analysis offers a multidimensional perspective on factors influencing cardiovascular endurance, enlightening the audience with a comprehensive understanding. Using standardized and well-established motor tests (e.g., Shuttle Run, Sit-ups, Grip Strength, and Standing Long Jump) enhances the reliability and validity of the physical fitness measurements. The findings directly affect curriculum development and health promotion among university students, particularly those studying in health-related fields. This study provides valuable baseline data that can be used to design longitudinal or intervention-based studies, especially within student populations with varying academic backgrounds. By highlighting the role of motor fitness and nutrition in cardiovascular health, the study contributes to the growing body of evidence supporting preventive health measures in young adults.

Conclusion

Conducting longitudinal studies could track the impact of changes in dietary habits and physical activity on cardiovascular endurance over a more extended period. Moreover, research involving a more extensive and diverse sample could provide additional insights into the composite interaction between diet, physical exercise, and cardiovascular endurance. Future research and interventions in this field could contribute to general health.

The research on motor test achievements and dietary habits provides a deeper understanding of the relationship between physical activity, diet, and health. The knowledge gained from this research is instrumental in identifying the factors that influence cardiovascular endurance and in devising strategies to improve student health.

By preventing health problems and enhancing our understanding of nutrition, we can develop strategies to reduce the risk of heart disease and other health issues among students. Education about healthy habits can have long-term benefits for people's health, given the modern lifestyle. The results of this research could significantly impact students' understanding of the importance of a healthy diet and adequate physical activity.

This current research could serve as a foundation for promoting a healthy lifestyle among the student population. It can improve the physical education curriculum by

providing insights into the effectiveness of the program. Moreover, it underscores the importance of theoretical lectures, which are increasingly necessary for better understanding and acceptance of a healthy lifestyle in today's world.

Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization: D. S., Investigation: S. M., Theoretical framework: D. S., Data curation: S. M., Resources: S. Đ., S. M., Writing – original draft: D. S., S. M., Writing – review & editing: S. Đ., All authors have read and agreed to the published version of the manuscript.

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THE INFLUENCE OF HALLIWICK METHOD ON MENTAL ADAPTATION IN AQUATIC ENVIRONMENT FOR YOUNG INDIVIDUALS WITH DOWN SYNDROME¹

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Abstract: The purpose of this study is to determine the effects of the "Halliwick" aquatic exercise program on changes of mental adaptation in water environment in young people with Down syndrome (DS). The sample of respondents consisted of 14 young people with DS, with average age of 21.8 ± 8.0 years. The research design is single-group included baseline, post-control and final measurements. The control period between baseline and post-control measurements lasted 12 weeks, equivalent to the duration of the experimental aquatic exercise program. The program included aquatic exercise classes with a frequency of two classes a week for 60 min (24 classes in total), with pre-planned training content through the world-renowned Halliwick method (in ten points) well adapted to people with disabilities. Mental adaptation in water environment was assessed using the WOTA2 test. The obtained results showed that the applied aquatic exercise program was effective in terms of statistically significant improvement of mental adaptation in water environment in young people with DS. The concept of this program can be recommended as a sport-recreational type of activity for people with DS for the purpose of improving health status, psychophysical abilities and physical activity.

Keywords: Halliwick method, WOTA test, Down syndrome

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Introduction

Down syndrome (DS) is a genetic disorder caused by the presence of an extra chromosome 21, affecting approximately 1 in 787 live births worldwide (Heinke et al., 2021). Characterized by a distinct set of physical and intellectual disabilities, individuals with DS often face developmental delays, cognitive impairment, and various health issues. These challenges include difficulties in adapting to new environments and activities due to sensory processing issues and cognitive limitations (Chapman & Hesketh, 2000). Consequently, engaging in physical activities, particularly in an aquatic environment, presents both challenges and opportunities for development.

The Halliwick method, developed by James McMillan in the late 1940s, is a specialized approach to teaching swimming and enhancing water-based activities for individuals with physical, intellectual, and developmental disabilities. This method is rooted in the principles of hydrotherapy and adapted physical activity, emphasizing mental adjustment, breath control, balance, and movement in water through a structured program (Lambeck & Gamper, 2011). The Halliwick method is particularly beneficial for individuals with DS, who often experience hypotonia (low muscle tone), hypermobility of joints, and cognitive challenges that can impede their physical and psychological well-being (Paul et al., 2019).

The aquatic environment offers unique therapeutic benefits for individuals with DS. The buoyancy of water reduces the impact on joints and facilitates ease of movement, which is particularly advantageous for those with muscular and skeletal limitations (Chera-Ferrario, 2012). Additionally, the resistance provided by water can help improve muscle strength and endurance (Getz et al., 2007). However, the mental adaptation to the aquatic environment is crucial for reaping these physical benefits. Mental adaptation in this context refers to the ability to adjust cognitively and emotionally to the water, including overcoming fear, enhancing concentration, and developing a sense of enjoyment and confidence in aquatic activities.

Research has demonstrated the effectiveness of the Halliwick method in improving both physical and mental skills in aquatic settings. For instance, a study on children with autism spectrum disorder, which shares some therapeutic parallels with DS, found significant improvements in mental adaptation, balance, and swimming skills following a structured Halliwick method (Vascakova et al., 2015). These findings underscore the potential of the Halliwick method to foster better mental adaptation in aquatic environments for individuals with developmental disabilities.

The primary aim of this research is to explore the influence of the Halliwick method on the mental adaptation of young individuals with DS to the aquatic environment.

By focusing on mental adaptation, this study seeks to understand how the structured and supportive framework of the Halliwick method can facilitate cognitive and emotional adjustments, thereby improving the overall aquatic experience for these individuals. This research provides insights into the effectiveness of the Halliwick method in fostering mental resilience, promoting psychological well-being, and enhancing the quality of life for young individuals with DS through aquatic therapy.

This research highlights the potential of the Halliwick aquatic exercise program as a sport-recreational activity for individuals with DS, aimed at improving their health status, psychophysical abilities, and physical activity levels. The positive outcomes suggest that such programs can be a valuable addition to the therapeutic and recreational options available for individuals with DS, contributing to their overall well-being and quality of life.

Methods

Design and Participants

This study employed a single-group design which included baseline, post-control, and final measurements. The sample consisted of 14 young individuals with DS, with an average age of 21.8 ± 8.0 years. Inclusion criteria for participation in the study were as follows: a confirmed diagnosis of DS, ability to understand and follow simple instructions, and medical clearance to participate in moderate physical activity. Exclusion criteria included any severe behavioral issues that could impede participation, contraindications to aquatic therapy, or recent surgeries or injuries that would prevent safe engagement in the exercise program.

Procedures

Before the first test (baseline measurement), the assessors underwent training and preparation to familiarize themselves with the techniques and protocols of the WOTA2 test. The mental adaptation testing in water was conducted at the "Aqua Spa Termale" swimming pool in Novi Pazar. The procedure involved two assessors: a swimming instructor who demonstrated and gave verbal instructions in the water, and a recorder stationed outside the water. These assessors were in constant communication when deciding on the final assessment of the participants' motor tasks. Optimal conditions for lighting, water temperature, air temperature, and humidity were ensured. All participants and their parents or guardians were informed about the protocol before testing began. The tests adhered to the ethical principles outlined in the Declaration of Helsinki on biomedical research involving human subjects (World Medical Association, 2013).

Intervention Program

The intervention program was conducted at the pool of the Sports Center "Novi Pazar" and the pool "Aqua Spa Termale" in Novi Pazar. The baseline measurement of all subjects was performed before the start of the program. Following this, there was a 12-week control period during which the subjects did not engage in any form of organized exercise beyond their regular physical education classes. After this period, a post-control measurement was taken, followed by a 12-week intervention program of water exercises.

During the 12-week intervention period, water exercise classes were held twice a week for 60 minutes each session, amounting to a total of 24 sessions. The sessions followed the Halliwick method (ten points) adapted for people with disabilities, incorporating elements of hydrotherapy (the exercise program is detailed in Table 1). The target attendance rate was set at >80%, allowing a maximum of five absences during the experimental period. After this period, a final measurement was taken.

The program aimed to enable individuals with DS to move safely and independently in water, essentially teaching them to swim. Instructors worked with several groups, maintaining an approximate instructor-to-child ratio of 1:3. Additional props were used to tailor the tasks to the age and handicap of the participants.

Table 1. 12-week Halliwick method programme

Week	Session	Halliwick Point
I	1-2	1. Mental Adjustment
II	3-4	2. Disengagement
III	5-6	3. Transversal Rotation Control
IV	7-8	
V	9-10	4. Sagittal Rotation Control
VI	11-12	5. Longitudinal Rotation Control
VII	13-14	
VIII	15-16	6. Combined Rotation Control
IX	17-18	7. Upthrust
X	19-20	8. Balance in Stillness
XI	21-22	9. Turbulent Gliding
XII	23-24	10. Simple Progression and Basic Swimming Stroke

Measures

The Water Orientation Test Alyn 2 (WOTA2) was utilized to assess orientation and functioning in water. This test comprises 27 items (skills) based on the ten-point principles of the Halliwick concept, but for the purpose of this study only items 1 –

13 were specifically assessed for Mental Adjustment (MA). The metric characteristics of the WOTA2 test have been verified in research by Tirosh, Katz-Leurer and Getz (2008), demonstrating very high reliability (ICC = 0.97). The testing and scoring protocol are detailed in the WOTA2 test evaluation manual (Tirosh, 2016).

Statistical Analysis

Descriptive statistics were employed to summarize the data. Paired sample t-tests were conducted to compare baseline and post-control measurements, as well as post-control and final measurements. Cohen's effect size (ES) was also calculated to determine the magnitude of the observed effects.

Results

The results of the paired sample t-tests, both at the item level (Figure 1) and for overall Mental Adjustment (Tables 2 and 3), indicate varying degrees of improvement in Mental Adjustment (MA) to the aquatic environment across different phases of the intervention program.

Item-Level Analysis

General Mental Adjustment to the Water: The participants showed a gradual improvement in general mental adjustment from the Baseline to the Final measurement. However, the significance levels indicate that this change was not statistically significant between Baseline and Post-Control but became more pronounced from Post-Control to Final.

Blowing Bubbles through the Mouth, Nose, and with Face/Head Immersed (Items 2, 3, 4): These items related to exhaling techniques showed modest improvements across the measurements. Although there were slight increases in performance from Baseline to Post-Control, significant improvements were observed mainly from Post-Control to Final, indicating that repeated exposure and practice had a cumulative positive effect on participants' comfort.

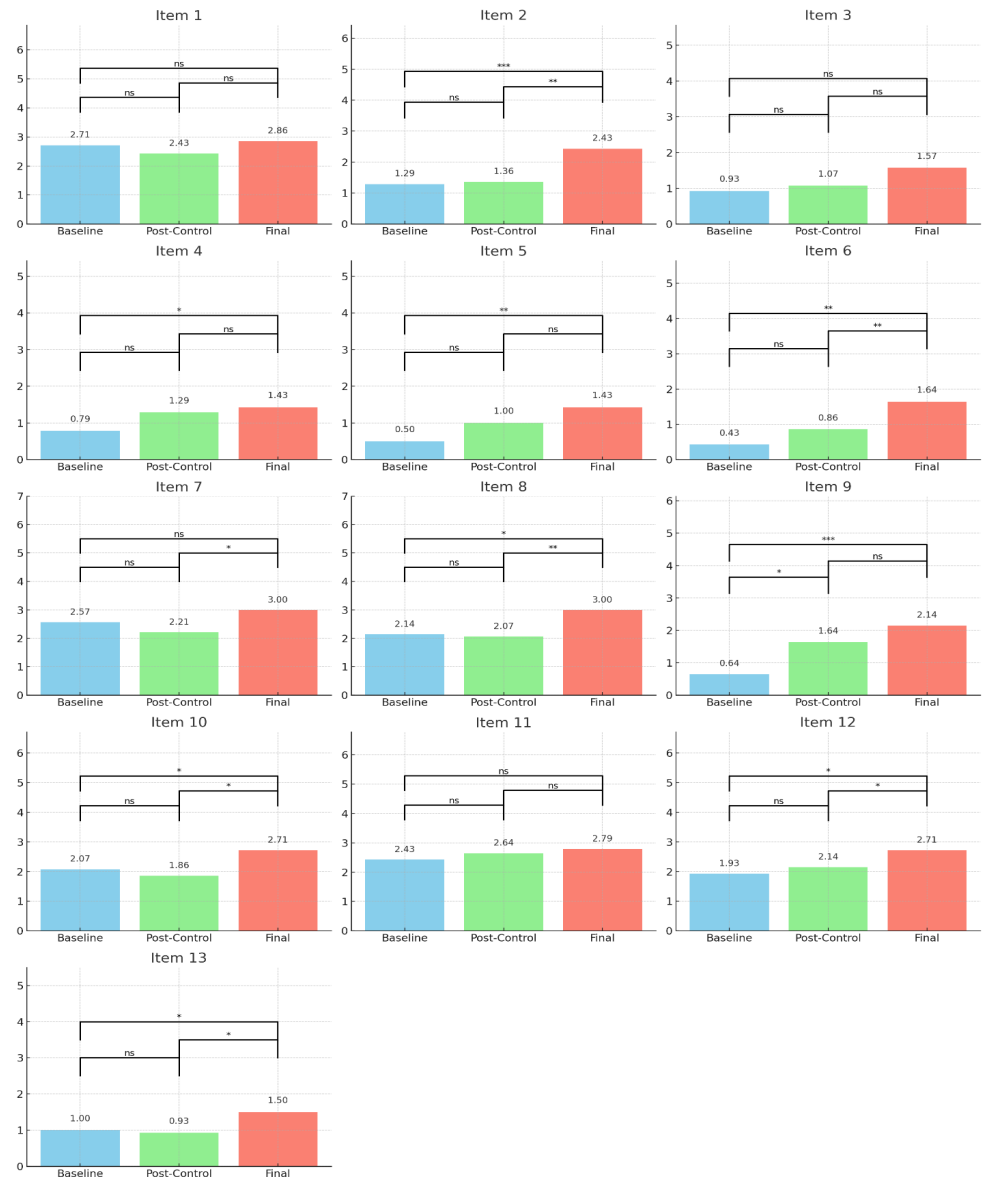
Rhythmically Exhaling while Moving & Exhaling Alternately from Nose and Mouth (Items 5, 6): These more complex exhaling tasks showed similar trends, with some improvement over time. However, the changes were more substantial between Post-Control and Final measurements, suggesting that as participants adapted more to the water environment, and their ability to perform these tasks improved significantly.

Entering and Getting out of the Water (Items 7, 8): The results show consistent improvement across all measurements for these fundamental tasks. The significant

differences between Post-Control and Final measurements indicate that participants gained confidence and autonomy in basic water entry and exit maneuvers.

Chair (Box) Position, Progression along Pool Edge, Walking across the Pool, Jumping across the Pool, and Jumping and Ducking in & out of Water (Items 9-13): These items, which involve more complex movements and interactions with the water, demonstrated notable improvements, especially between the Post-Control and Final measurements. The most significant changes were observed in tasks involving movement and balance (e.g., walking and jumping in water), reflecting the effectiveness of the Halliwick method in enhancing participants' physical coordination and mental adjustment.

Figure 1. Differences in items scores between baseline, post-control and final measurements. *Item 1* = General Mental Adjustment to the water; *Item 2* = Blowing bubbles through the mouth; *Item 3* = Blowing bubbles through the nose; *Item 4* = Blowing bubbles with face/head immersed; *Item 5* = Rhythmically exhaling while moving; *Item 6* = Exhaling alternately, from nose and _mouth; *Item 7* = Entering the water; *Item 8* = Getting out of the water; *Item 9* - Chair (Box) Position; *Item 10* = Progression along pool edge using hands; *Item 11* = Walking across the pool; *Item 12* = Jumping across the pool; *Item 13* = Jumping and ducking in & out of water; ns = Not significant ($p > 0.05$); * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.



Overall Mental Adjustment (MA%) Analysis

The paired sample t-test results provided additional insights into the overall effectiveness of the intervention:

Baseline vs. Post-Control: The results in Table 2 shows there was a slight increase in the overall MA% from 49.82 to 54.58. However, this change was not statistically significant ($p = 0.325$), indicating that the initial 12-week control period without specialized aquatic exercises did not lead to substantial improvements in mental adaptation.

Post-Control vs. Final: The results in Table 3 showed a significant increase in MA% from 54.58 to 74.91 ($p = 0.005$), with a large effect size ($ES = 0.90$). This substantial improvement suggests that the 12-week Halliwick aquatic exercise program had a strong positive impact on the mental adaptation of young people with DS to the aquatic environment.

Table 2. Differences between Baseline and Post-control measurements of overall Mental Adjustment scores.

Variable	N	Baseline	Post-Control	t	p	ES
		Mean $\pm$ SD	Mean $\pm$ SD			
MA%	14	49.82 $\pm$ 24.24	54.58 $\pm$ 29.21	1.023	0.325	0.27

Notice. N = Number of participants; Mean $\pm$ SD = Mean value $\pm$ Standard Deviation; t = t-statistic from the paired sample t-test; p = Statistical significance; ES = Effect Size.

Table 3. Differences between Post-Control and Final measurements of overall Mental Adjustment scores.

Variable	N	Post-Control	Final	t	p	ES
		Mean $\pm$ SD	Mean $\pm$ SD			
MA%	14	54.58 $\pm$ 29.21	74.91 $\pm$ 18.55	3.371	0.005*	0.90

Notice. N = Number of participants; Mean $\pm$ SD = Mean value $\pm$ Standard Deviation; t = t-statistic from the paired sample t-test; p = Statistical significance; * = $p < 0.05$; ES = Effect Size.

These results highlight a significant improvement in mental adaptation between the Post-Control and Final measurements, with a large effect size, indicating a strong impact of the intervention program. The difference between Baseline and Post-Control, however, was not statistically significant.

Discussion

The main purpose of this study was to examine the effects of a 12-week Halliwick aquatic exercise program on mental adaptation to the aquatic environment in young individuals with DS. The main findings showed that participants improved significantly in their mental adaptation to the aquatic environment. These observed improvements are consistent with and extend the findings of limited existing literature, highlighting the potential for such programs to promote both physical and psychological well-being in this population.

Similar to the findings of Torlaković and Šebić (2022), baseline testing in our study revealed that participants were not well adapted to the aquatic environment at the start of the intervention. However, after the implementation of the Halliwick program, notable improvements were observed in their psychological adaptation to the water.

The findings of this study are also consistent with those reported by Naczek et al. (2021), where significant improvements in mental adaptation and balance control were observed following a structured swimming program. The reported effect sizes in mentioned study were particularly large, demonstrating the profound impact that well-designed aquatic interventions can have on individuals with DS. Similarly, the current study found substantial progress in participants' engagement with and adaptation to the water environment.

Moreover, Milligan et al. (2022) found significant improvement in specific mental adjustment activities, such as the ability to blow bubbles in water, reflecting increased comfort and control in an aquatic setting. The present study's findings support these observations, further underscoring the effectiveness of aquatic programs in promoting both mental adaptation and overall aquatic readiness in individuals with DS.

The findings are consistent with those reported by Hartlage et al. (2021), who found significant improvements in WOTA-1 scores among children with DS after participating in aquatic physical therapy. Their findings support the assumption that aquatic interventions are especially effective at improving both mental and physical adaptation to water, which is consistent with the findings of this study using the WOTA-2 test. It is important to note that while the WOTA1 and WOTA2 tests are used to assess water orientation and mental adaptation, they are not directly comparable due to differences in their structure and scoring systems. However, both tests include similar items related to mental adjustment and fundamental aquatic skills, such as floating and breath control. The improvements observed in this study using the WOTA2 test align with the general objectives of the WOTA1 test, indicating that

both tools, despite their differences, effectively measure core aspects of water adaptation that are crucial for individuals with DS.

In addition to the objective measures of improvement, qualitative feedback from participants and their parents or guardians provided valuable insights into the broader impact of the program. Although this study did not employ questionnaires or other formal methods to collect data on participants' and parents' reports of their attitudes, informal feedback from parents indicated that their children were highly enthusiastic about participating in the aquatic sessions. This finding echoes the results of Naczek et al. (2021), where parents observed significant satisfaction and increased confidence in their children's engagement with water activities. Moreover, Tsolaki et al. (2023) noted that parents of children with intellectual disabilities and autism spectrum disorders reported improvements in their children's attitudes and self-confidence, which extended beyond the aquatic environment into other aspects of daily life. This broader impact is similarly reflected in the current study, where participants not only improved their water-related skills but also demonstrated greater confidence and independence. These reports highlight the importance of incorporating engaging and enjoyable activities into therapeutic programs, as they can significantly enhance both adherence and overall outcomes for individuals with DS.

The practical implications of these findings are significant for therapeutic practice. The Halliwick method, with its structured approach to mental adjustment and progressive skill development, proves to be a valuable tool in promoting both physical and psychological well-being in individuals with DS. As demonstrated by both the current study and Milligan et al. (2022), systematic exposure to aquatic activities not only enhances physical capabilities but also fosters confidence and enjoyment, which are crucial for long-term engagement in physical activity. The similarities in findings between previously mentioned study and those by Tsolaki et al. (2023) suggest that aquatic therapy can have far-reaching benefits beyond immediate physical and mental adaptations. The improvements in daily life skills and overall quality of life reported by participants and their families underscore the potential for aquatic therapy to be integrated into broader therapeutic and educational programs for individuals with DS and other developmental disabilities.

While the results are promising, the small sample size and single-group design present limitations that should be addressed in future research. Larger, more diverse samples and randomized controlled trials would help validate these findings and provide a more robust evidence base. Additionally, exploring the long-term effects of the Halliwick method on both mental adaptation and overall quality of life in individuals with DS would provide deeper insights into the sustainability of these benefits.

Conclusion

This study reinforces the growing evidence that supports the use of aquatic therapy, particularly the Halliwick method, in enhancing mental adaptation and aquatic skills among individuals with DS. The findings suggest that such programs not only improve physical abilities but also play a crucial role in enhancing psychological well-being and quality of life, making them a valuable component of therapeutic interventions for this population.

Author Contributions

The authors declare no conflict of interest.

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

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POSITIONAL DIFFERENCES IN EXPLOSIVE POWER, SPEED AND AGILITY IN ADOLESCENT HANDBALL PLAYERS

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Abstract: Handball determines as a complex, team sport, where high-intensity activities are followed by short-term movements and low-intensity activities. The aim of this research was to determine whether there are differences in the explosive power of the lower extremities, speed and agility in adolescent handball players in relation to their position in the team. The sample of respondents consisted of 16 young handball players with handball experience 5.88 ± 1.86 years and age: 16.75 ± 1.29 years: who were divided into subsamples depending on the position they play: goalkeepers (n=6) wings (n=6) and defenders (n=4). The results showed statistically significant differences only in slalom agility test, while there were no significant differences in vertical jump height and speed tests. Subsequent comparisons, using the Turkey HSD test, show that players in the position of goalkeeper ($M = 0.75$; $SD = 0.28$) and wings ($M = -0.75$; $SD = 0.28$) differ statistically significantly ($p = 0.04$) in the results of the slalom test. These results may prove to be beneficial for talent assessment and evaluation as well as for the creation and improvement of position training regimens. Additionally, enhancing the position-specific profiling, it would appear worthwhile to incorporate additional performance assessments in future research that concentrate on muscle strength or reaction times in all positions of the team.

Keywords: handball, explosive power, speed, agility

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Introduction

Handball determines as a complex, team sport, where high-intensity activities are followed by short-term movements and low-intensity activities (Hermassi et al., 2019; Michalsik et al., 2015). During a handball game, an average of 825 high-intensity activities lasting from two to six seconds, 14 jumps, seven throws and an average of 12 one-on-one situations are performed during one offense (Póvoas et al., 2012). Frequent changes in the rules of the game have led to the intensification of the game (Michalsik et al., 2015), therefore, high level of physical fitness of the players is required. Strength, speed and agility are crucial factors for playing handball at the elite level (Gorostiaga et al., 2005; Mohamed et al., 2009).

Players have distinct physical fitness levels, body compositions, and morphological profiles based on their position, which dictates their function on the court. In general, the anthropological model of "the top-quality handball player" implicitly presents specific physical conditions and movement structures of the technical and tactical elements of handball. This model emphasizes the importance of optimally harmonizing the level and structure of motor and morphological attributes. Some studies on the morphological profile of a professional handball player have revealed that he has a predominant mesomorphic somatotype with a hint of ectomorph, or a significant longitudinal dimensionality of the skeleton (Srhoj et al., 2002; Sibila, Pori, 2009). Moreover, goalkeepers and back players are the tallest and have the biggest arm spans on the squad, while wing players are the shortest. Previous researches (Bayios et al., 2001; Gorostiaga et al., 2005) emphasize strength and its aspects as the most discriminating ability. According to van der Kruk et al., (2018), power is the capacity of an athlete to recruit as many motor units as possible in the shortest amount of time. It shows up as particular explosive movement patterns in a variety of sports (Šimonek et al., 2017). Maximum strength is necessary for performing blocks, pushing and throwing the ball at high speed, while explosive strength of the upper and lower extremities is necessary when performing various jumps and when quickly changing directions and directions of movement (Massuca et al., 2015), as well as when throwing the ball (Gorostiaga et al., 2005). A ball thrown at maximum speed is difficult for goalkeepers to see and gives defenders significantly less time to react with an adequate shot block (Manchado et al., 2013). Also, agility is one of the most prevalent skills in the handball game (Čavala, Katić, 2010), the significance of which is reflected in frequent, sudden movements and stops, as well as changes in the direction and direction of movement, reacting to an unforeseen stimulus (Massuca et al., 2014).

Some authors (Chaouachi et al., 2009; René Schwesig et al., 2016) pointed out that there is greater homogeneity among players in different positions in handball, compared to other team sports, however, many studies (Rousanoglou et al., 2014; R. Schwesig et al., 2017; Zapartidis et al., 2011) that have dealt with this issue have shown that the level of physical fitness depends on the specific position the player has in the team. Wings cover the greatest distance covered as well as the distance covered with high intensity, sprinting (Luig et al., 2008), full-backs perform the highest number of shots and passes, while players who play in the pivot position and goalkeeper position, due to their specific role, have the least values of distance covered, number of sprints and vertical jumps (Ohnjec et al., 2008). Also, it is very important to emphasize that the level of physical fitness is connected and conditioned by anthropometric characteristics and body composition (Čížmek et al., 2010; van den Tillaar, Ettema, 2004).

Despite the growing body of literature on physical performance in adolescent athletes, limited attention has been given to the specific positional differences in power, speed, and agility among handball players. Most studies in handball tend to focus on adult or elite-level athletes, overlooking how positional roles shape the physical demands in youth athletes. This leaves a gap in understanding the early development of position-specific attributes during adolescence - a critical period for talent identification and tailored training programs. Additionally, while research has highlighted the importance of agility and speed in handball, these attributes are often studied independently without sufficient consideration of how they vary across positions such as goalkeepers, wings and backs. Existing research also lacks consensus on whether youth players in different positions require specific conditioning programs to optimize performance and reduce injury risk. Thus, there is a need for comprehensive studies that evaluate positional differences in key performance indicators - such as explosive power, speed, and agility - among adolescent handball players to inform evidence-based training strategies for long-term development. Addressing this gap will help coaches and practitioners refine their approach to developing position-specific performance profiles at a crucial stage of athletic growth.

Methods

Participants

All subjects were in the same professional handball club (R.K. Železničar), and involved in regular handball competition at the time of the study. The sample of respondents consisted of 16 young handball players with handball experience 5.88 ± 1.86

years (age: 16.75 ± 1.29 years; body mass: 83.52 ± 14.05 kg; body height 181.15 ± 7.4 cm; percentage fat 18.27 ± 6.93 ; percentage muscle mass 40.39 ± 3.90), who were divided into subsamples depending on the position they play: goalkeepers ($n = 6$; age: 16.5 ± 1.76 ; body mass: 95.20 ± 14.60 kg; body height: 181.67 ± 10.11 cm), wings ($n=6$; age: 16.67 ± 1.21 years; body mass: 74.15 ± 9.54 kg; body height: 179.92 ± 4.97 cm) and defenders ($n=4$; age: 17.25 ± 0.50 ; body mass: 80.07 ± 3.97 kg; body height: 182.5 ± 5.56 cm). All of the participants who were involved in the training process were completely healthy, without any hidden injuries.

Procedures

On the same day prior to testing, all players received training on testing protocols. Each test was verbally explained and shown by the same research team member during familiarization, and each test was subjected to submaximal and maximum trials until both the player and the team member were satisfied. A separate testing session saw players completing a series of performance tests on an indoor court. All athletes had a standardized 10-minute warm-up that included running, multidirectional dynamic stretching, and jumping (submaximal squat and ankle leaps) prior to testing. The players were told not to engage in any physically demanding activities for the 24 hours before the exam. Each test was performed by the players three times, with a three-minute break in between. The outcome measure that was recorded was the best performance. In the prescribed order, the following tests were given.

Sample of measuring instruments

Anthropometric characteristics

The anthropometric characteristics of the subjects were measured so that the subjects were barefoot, in sports equipment. The subject's body height was measured with an anthropometer according to Martin (GPM anthropological instruments, Swiss), with a reading accuracy of 0.1 cm, while the subject's body mass and body composition were measured with an Omron BF 511 scale (Omron Healthcare Co, Kyoto, Japan), with a reading accuracy of 0.1 kg and 0.1 % body fat. Adult respondents voluntarily took part in the testing, while minors took part in the testing after written confirmation from their guardians.

Tests for evaluating the explosive strength of the lower extremities

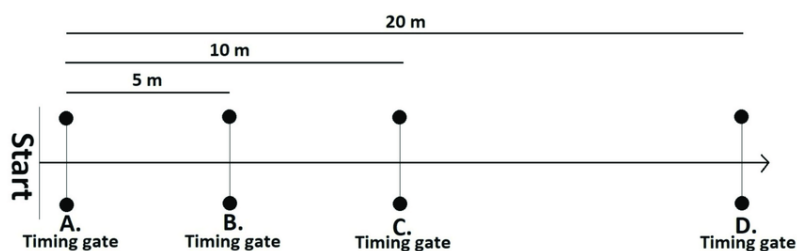
The countermovement jump (CMJ) was assessed according to the protocol described by Bosco et al. (1983) and used to calculate the players' explosive power. The partici-

pants were instructed to conduct a downward motion before to the jump and to begin in an upright posture with their legs straight and their hands on their hips (to remove the impact of an arm swing on jump height). Before taking off, they did a natural flexion. When they landed, the participants were told to bend their knees and land erect. Same procedure was assessed for countermovement jump with arm swing (CMJA). The difference was that the hands are free and the move upward when the jump starts. The squat jump (SJ) tests began with the subjects squatting with their hands on their hips and their knees at a 90-degree angle. Participants leaped for maximum height without any counter movements. Each player performed three maximal CMJ, CMJA and SJ jumps, there was a 30-second pause in between each jump repeat. The highest score was used for further analysis. The jumps were assessed using a portable device, called the OptoJump System (Microgate, Bolzano, Italy), which is an optical measurement system that consists of transmitting and receiving bars. Photocells are located 2 mm above the ground in each of these. The transmitting and receiving bars' photocells are always in communication with one another. The algorithm determines how long any communication breakdowns between the bars last. The validity and reliability of which was confirmed (Glatthorn et al., 2011). This enables the measurement of jump height and flight duration during a jump performance. Centimeters are used to represent the leap height.

Speed tests

A maximal sprint at 5 m, 10 m, and 20 m was used to measure speed (Fig.1). The subject's pace increased through the first two gates until reaching their maximum speed when they passed through the last gate. The test was administered three times to each person, with a 30-second rest in between. The quickest time was used for additional statistical analysis. The device used was a photocell system (Witty, System, Microgate, Bolzano, Italy). Photocells were positioned 5, 10, and 20 meters apart from the starting line. The photocells were placed at the hip level of all subjects, in order to minimize the effect of swinging the arm when passing through the gate (Yeadon et al., 1999).

Figure 1. Sprint 5m, 10m, 20m

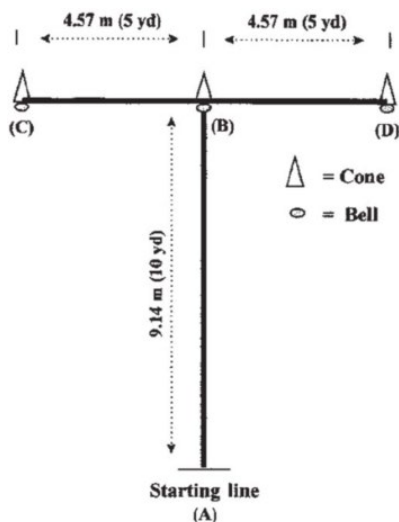


Agility assessment tests

T test

This test (Fig. 2) was administered using the protocol outlined by Semenick (Semenick, 1990). Both feet were behind the starting line when the subjects began. Two more cones were positioned 4.57 meters on either side of the second cone, and a fourth cone was positioned 9.14 meters from the beginning cone to form a T shape. Every participant sped up to a cone and used their right hand to contact the base of the cone. Keeping their feet crossed and facing forward, the subjects had to shuffle to the next cone on the left and touch its base with their left hand, then to the next cone on the right and touch its base with their right hand, and finally to the last cone on the left and touch its base. The cones were 30 cm tall. Lastly, participants ran as fast as they could backwards to reach the starting/finish line. If athletes failed to touch the base of the cone, crossed one foot in front of the other, or failed to face forward throughout the test, they had to repeat it. Using an electronic timing device, the test's completion time was evaluated as a performance outcome.

Figure 2. T test

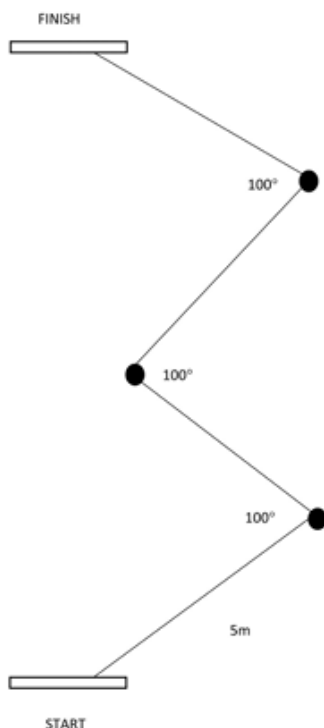


Zig-Zag test

In the zig-zag test (Fig. 3), athletes had to accelerate and decelerate as quickly as they could around each of the four 5-meter portions (for a total linear distance of 20 meters) marked with cones positioned at 100° angles, which was conducted on an indoor court. There was a 5-minute rest period between each of the two maximal

attempts. The participants were told to finish the test as fast as they could before reaching the second set of timing gates, which were positioned 20 meters from the starting line, after beginning in a standing stance with the front foot 0.3 meters behind the first set of timing gates. Out of the two attempts, the fastest time was kept for additional examination (Little, Williams, 2005).

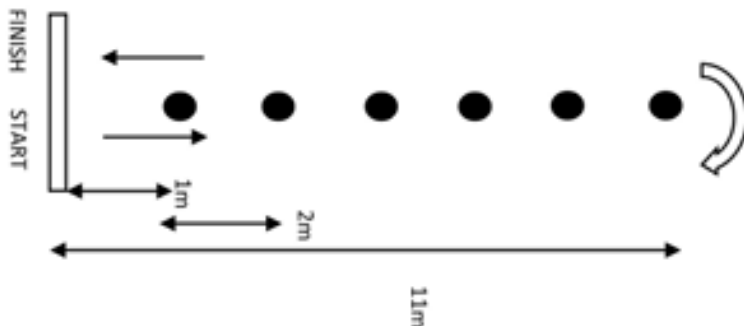
Figure 3. Zig-Zag test



Slalom test

Six cones were used in the slalom test (Fig. 4). The first cone was the only one that was 1 meter from the starting line; the other 5 were separated by 2 meters. Beginning at the starting line, the competitors alternatively avoid all of the cones (moving 90° to point C, then running to point D, then avoiding the cone again by 180°, and finally sprinting through the target line at point E). Results are recorded in seconds (Sporis et al., 2010).

Figure 4. Slalom test



Agility was evaluated using three tests: the T test, the zig-zag test and the slalom test. The subjects repeated each of the tests three times, with a 30-second break between repetitions of one test and a 5-minute break between different tests. The fastest time on the agility tests was taken into further statistical analysis of the data. Agility was assessed with a photocell system (Witty, System, Microgate, Bolzano, Italy), and the entire testing procedure was in accordance with the guidelines given in earlier research.

Statistical data processing

Data processing was performed with the IBM SPSS statistics program (version 26.0; Inc., Chicago, IL, USA). To gather fundamental data on the respondents, descriptive statistics were applied. The normality of the data distribution was checked by the Kolmogorov - Smirnov test for all dependent variables, while the one-factor analysis of variance (ANOVA) was used to determine the differences in the physical fitness of handball players in relation to their position in the team, the statistical level of significance was set at $p < 0.05$. Following confirmation that there were statistically significant differences between the groups, they were compared using the Tukey HSD test to identify which responder groups were statistically different.

Results

Table 1. Descriptive statistics of respondents by positions in the team

Position	Goalkeeper	Wings	Backs
N	6	6	4
Age (years)	16.50 ± 1.76	16.67 ± 1.21	17.25 ± 0.50
HE (years)	6.50 ± 1.64	4.67 ± 2.06	6.75 ± 0.96
BM (kg)	95.20 ± 14.60	74.15 ± 9.54	80.07 ± 3.97
BH (cm)	181.67 ± 10.11	179.92 ± 4.97	182.5 ± 5.56
PF (%)	24.58 ± 4.60	13.88 ± 5.90	14.30 ± 3.04
PMM (%)	36.98 ± 2.52	43.22 ± 3.31	41.97 ± 2.49

N – number of respondents; **HE** – handball experience; **BM** – body mass; **BH** – body height; **PF** – percentage of fat; **PMM** – percentage of muscle mass; ± - mean value ± standard deviation

According to Table 1's descriptive statistics analysis, it can be concluded that the average age of handball players is 16.75 ± 1.29 years and that they are in the training process for 5.88 ± 1.86 years. The average body mass of handball players is 83.53 ± 14.05 kg, goalkeepers have on average the highest body mass - 95.20 ± 14.60 kg, but also the highest percentage of fat deposits - $24.58 \pm 4.60\%$, as well as the lowest values of muscle mass - 36.98 ± 2.52 kg. Backs have the highest average body height - 182.5 ± 5.56 cm, while wing players have the lowest percentage of body fat $13.88 \pm 5.90\%$ and the highest percentage of muscle mass - $43.22 \pm 3.31\%$.

Table 2. Results of physical fitness tests of subjects in relation to position in the team (ANOVA)

Variables	GOALKEPER (n=6)	WINGS (n=6)	BACKS (n=4)	Sig. (p < 0.05)
CMJ (cm)	35.4 ± 5.04	36.2 ± 2.32	36.9 ± 4.11	.402
CMJA (cm)	37.3 ± 4.07	39.4 ± 5.04	38.7 ± 3.43	.186
SJ (cm)	33.9 ± 2.57	34.5 ± 3.43	35.19 ± 4.32	.407
Speed 5m (s)	2.13 ± 0.16	2.09 ± 0.13	2.02 ± 0.14	.281
Speed 10m (s)	2.93 ± 0.26	2.75 ± 0.34	2.69 ± 0.2	.074
Speed 20m (s)	3.72 ± 0.3	3.63 ± 0.24	3.51 ± 0.26	.077
T test (s)	7.53 ± 0.9	6.01 ± 0.45	6.62 ± 0.7	.051
Zigzag test (s)	9.24 ± 0.25	8.63 ± 0.72	8.85 ± 0.45	.206
Slalom test (s)	11.23 ± 1.12*	10.48 ± 0.85	10.89 ± 0.68	.033

Sig. – Significance level, **CMJ** – counter movement jump; **CMJA** – counter movement jump with arm swing; **SJ** – squat jump; * values significantly different from those obtained by wings; p < 0.05.

Differences in physical fitness according to team status were examined using one-factor analysis of variance. Goalkeepers, wingers, and defenders were the three categories into which the responders were split. A statistically significant difference at the $p < 0.05$ level was found only in the T test $F(2,16) = 4.09$, $p = 0.051$ and the slalom test $F(2, 16) = 4.51$, $p = 0.033$. Subsequent comparisons, using the Tukey HSD test, show that players in the position of goalkeeper ($M = 0.75$; $SD = 0.28$) and wings ($M = -0.75$; $SD = 0.28$) differ statistically significantly ($p = 0.04$) in the results of the slalom test. Eta-square was used to determine the size of the effect of the difference and in this case, it was 0.41, which according to Cohen, represents a large effect of the difference between goalkeepers and wing players in the slalom test.

Discussion

The aim of this research was to determine whether there are differences in the explosive power of the lower extremities, speed and agility in handball players in relation to their position in the team. The results showed statistically significant differences only in slalom agility test, while there were no significant differences in vertical jump height and speed tests.

It is believed that among team handball players, dynamic strength and jumping ability are strongly correlated (Bonifazi et al., 2001). In addition, the results of the research did not prove statistically significant differences in the height of the vertical jump among young handball players. It was found that goalkeepers have the lowest average vertical jump height, but that these differences are not statistically significant. These results confirmed the conclusions of previous research (Chaouachi et al., 2009; Vila et al., 2012), that there are no differences in the manifestation of maximum explosive power. On the other hand, many researchers, (Haugen et al., 2016; Hermassi et al., 2019; Oxyzoglou et al., 2008; Weber et al., 2018), came to the conclusion on a specific population of handball players, that the height of the vertical jump differs amongst players' position. Oxyzoglou et al. showed that goalkeepers have high values of explosive power, predominantly of the upper extremities, and high values of pelvic flexibility. However, in this research, the explosive strength of the upper limbs, as well as flexibility, was not tested, so it is not possible to build on the previous research. On the contrary, players in the positions of wings and backs have higher values of the height of the vertical jump in relation to goalkeepers and pivotmen in the tests of the explosive power of the lower extremities (Čavala, Katić, 2010; Haugen et al., 2016; Hermassi et al., 2019; Oxyzoglou et al., 2008). Namely, handball players in the positions of wings and backs perform a greater number of

jumps compared to other positions (Okuno et al., 2013; Sporiš et al., 2010). The fact is that wing players are involved more in horizontal jumps in the game, in order to reduce the distance from the goal and send a more accurate shot (Christodoulidis et al., 2009), however, the high values on the vertical jump tests are the consequence of the large forces produced in a very short period of time, in a limited space (Haugen et al., 2016). Defenders, contrary to wing players, perform the largest number of activities that include the element of vertical jump, due to the specific requirements of the position, which implies a large number of jumps, in combination with shots, because the highest frequency of shots, defenders perform from a distance of 9 to 13 m, and a high vertical a jump is necessary to avoid a potential block (Christodoulidis et al., 2009; Krüger et al., 2014).

The capacity to run and sprint repeatedly at a high intensity is crucial for success, according to prior researches (Rannou et al., 2001; Mohamed et al., 2009; Souhail et al., 2010), which has shown that maximal running speed has an effect on performance. However, in this case, the sprinting speed at 5, 10 and 20 m did not differ statistically significantly in relation to the position in the team. Previous research examining sprinting differences has been rather contradictory. While they determined that there are differences with the tendency for wing players to have higher values on the maximum speed tests, the others came to different results and stated that there are no differences on the 20 m running tests (Gorostiaga et al., 2005; Krüger et al., 2014). Namely, players in all positions need starting acceleration, which is tested with a five-meter running test, due to the specific movements in handball that each player has (Krüger et al., 2014). Shorter distances wing players run slower, however, with increasing distance - up to 30 m, wing players and defenders have better results in speed tests (Luig et al., 2008; Sporiš et al., 2010). These results are consequence of a specific role in the team, because during a handball game, players in these positions perform the most sprints between 20 and 30 m, during transformations from attack to defense with sudden accelerations, stops and changes in direction and direction of movement, which depends, in addition to specific roles, in addition to the space they cover (Christodoulidis et al., 2009; Luig et al., 2008). At the same time, during the game, wing players spend 18% of the total time performing activities of 3.5 m/s and 4% of the time, activities of 5.2 m/s (Šbila et al., 2004).

Agility is crucial for wing players (Susatha et al., 2021). The results of the study only showed statistically significant differences in the slalom test between players in the position of goalkeeper and wings. Namely, technical and tactical abilities, as well as the factor of anticipation are much more important to goalkeepers than the ability to be agile, where based on the situation in the game, the movement of the ball, opposing players and teammates, he must react in a timely and adequate manner (Vignais et al.,

2009), also, goalkeepers have a limited space in which to move (Luteberget, Spencer, 2017), so according to the requirements of the game, agility is the ability that is least involved in their performance. On the other hand, due to the aforementioned specificities in movements, which are required when shooting from different angles, Srhoj and associates (Srhoj et al., 2002), determine agility as the most important ability. Unlike goalkeepers, there are no statistically significant differences between wings and defenders in agility tests. The defenders, as the organizers of the game, provide the players who play in other positions with their movements, the opportunity to score goals more easily. When performing tactical actions in the attack, the defenders circle, run through, run out and demarcate. Also, hand-ball players who play in the position of defender, have better results on specific tests with the ball, which include agility, especially in situations that involved a shot from a jump or a shot from the movement, with the highest speed of throwing the ball (Haugen et al., 2016; Hermassi et al., 2019; Oxyzoglou et al., 2008; Vila et al., 2012; Weber et al., 2018). However, this research failed to detect such differences, as specific ball tests were not included in the study. It is necessary to point out body composition as a possible cause of differences between goalkeepers and wing players. However, Atakan and associates (Atakan et al., 2017), found that excess body mass as well as a higher percentage of fat have a negative effect on agility. The results showed that goalkeepers have a higher body height, a lower percentage of muscle mass and a higher percentage of fat compared to wing players. Also, wing players have a higher percentage of muscle mass and have a mesomorphic body type.

Statistically insignificant differences in a large number of tests are reflected in the small number of respondents, also, the study did not include players in the position of pivotman. It should be taken into account the fact that the testing was carried out at the end of the competitive season, when the players gradually stopped the training process. Also, a large heterogeneity was observed in the age of the respondents, who are still in the process of development, the physical requirements are not yet at the level of professionals, so it is much more difficult to determine the differences that exist. Future research, for more relevant detection of differences, should adapt the selection of tests to the specific requirements of the handball game, which will mean specific tests with and without the ball, as well as specific tests of reactive agility with a combination of both horizontal and vertical jumps.

Conclusion

The current study showed a statistically significant difference between goalkeepers and wings in the slalom test. These results may prove to be beneficial for talent assessment and evaluation as well as for the creation and improvement of position training regimens. Despite the fact that the level of the most important physical fitness tests were determined by specific technical, tactical tasks and body composition, there were no statistically significant differences. The results should be taken questioningly, due to the small number of subjects and the specific time of testing, as well as the use of general tests. As a result, one useful suggestion for coaches would be to tailor the physical performance training curriculum to the particular position. To enhance the position-specific profiling, it would appear worthwhile to incorporate additional performance assessments in future research that concentrate on muscle strength or reaction times in all positions of the team. Finally, it is necessary to look at the whole picture in detail, in order to maximize training simulations and make them as handball-specific as possible, as well as to strengthen weaknesses in each position in order to achieve adequate results.

Conflict of interests:

The authors declare no conflict of interest.

Author Contributions:

Conceptualization: S.P., A.L. Investigation: A.L. Theoretical framework: S.P. Data curation: A.L. Resources: S.P., A.L., V.A. Writing – original draft: S.P., A.L. Writing – review & editing: S.P.

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CONCURRENT VALIDITY OF TWO DIFFERENT TYPES OF OMRON BODY COMPOSITION MEASURING DEVICES IN KARATE ATHLETES

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Abstract: The aim of this study was to examine the validity of two types of OMRON body composition analysers (BF 511 and VIVA) in comparison with the InBody 270 body composition analyser, in karatekas. The measurements were performed during the summer national camp of the FUDO-KAN Karate Federation, and the sample of subjects included 20 men and 27 women (Age = 16 ± 5.99 years; Body height = 158 ± 14.13 cm; Body mass = 51 ± 17.29 kg), and the following body composition variables were used: body mass (BM), body fat percentage (%BF) and skeletal muscle mass percentage (%SMM), which were estimated using all three body composition scales. Pearson correlation coefficient (r) and the coefficient of determination (r^2) were used to determine the validity of both OMRON body composition analysers. A high correlation of BM InBody with BM OMRON (BF 511 – $r = 0.99$, $r^2 = 0.99$; VIVA – $r = 0.99$, $r^2 = 0.99$), %BF InBody with %BF BF 511 ($r = 0.92$, $r^2 = 0.84$), and %BF InBody with %BF VIVA ($r = 0.63$, $r^2 = 0.40$), %SMM InBody with %SMM BF 511 ($r = 0.68$, $r^2 = 0.46$) were observed. The results obtained indicate that there are certain deviations, especially when it comes to assessing skeletal muscle, when compared with the InBody 270 body composition scale.

Keywords: body mass, percent of body fat, percent of skeletal muscle mass, OMRON BF 511, OMRON VIVA

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Introduction

Monitoring body composition is essential in sports science, especially for athletes, as key parameters like body fat percentage (%BF) and skeletal muscle mass percentage (%SMM) play a crucial role in optimising performance and evaluating the effects of training (Santos et al., 2020). Accurate measurement of these parameters enables athletes and coaches to tailor training and nutrition strategies effectively. Body composition assessment plays a significant role in understanding the physiological adaptations during athletic training (Nunes et al., 2019). As the body composition of athletes influences their performance, having reliable and accessible tools for assessment is paramount (Santos et al., 2020).

Various methods are utilised to assess body composition, including the InBody 270 multi-frequency body composition analyser and the OMRON BF 511 and VIVA. While InBody 270 is validated due to its precision in measuring fat and lean mass, its high cost and limited accessibility make it less feasible for widespread use (Larsen et al., 2021). In contrast, the OMRON devices offer a more accessible and affordable alternative for body composition assessment, making them popular tools for athletes and fitness professionals. These devices are widely marketed as reliable and user-friendly, but their accuracy compared to the other devices needs further validation in sports contexts (Ling et al., 2011). Recent studies have raised concerns about the accuracy of BIA devices, particularly in athletic populations where precise measurements are crucial for performance optimisation (Ciccone et al., 2020).

BIA devices, which use electrical impedance to measure body composition, are often marketed as reliable. It works by sending a low-level electrical current through the body, and the resistance encountered by this current is used to predict the amount of body fat. They use proprietary algorithms to measure total body fat and lean tissue mass (muscles, bones, and other tissues), offering simplicity and practicality for athletes and healthcare professionals (Aanstad et al., 2014). Even though it is a safe, non-invasive, cost-effective, and easily transportable technique, this method is affected by the body's hydration level, owing to the electrical conductivity of biological tissues (McLester, 2020). Moreover, population-dependent predictive equations may introduce systematic bias, particularly when precise body composition evaluation is essential (Kabiri et al., 2015).

Despite their widespread use, concerns have been raised regarding the accuracy of BIA devices compared to other body composition devices (Larsen et al., 2021). Several studies have been conducted to assess the validity of BIA devices, yielding mixed results. For instance, studies have shown a high correlation between BIA

measurements with different tools for specific parameters such as body fat and lean mass (Silva et al., 2018). However, other findings indicate potential discrepancies in body fat measurement and underestimation of body fat when using BIA devices, especially in specific populations (Stojanović et al., 2017). These variations underscore the urgent need for further research to validate BIA devices in sports populations, where precise body composition measurements are critical for performance optimisation. This emphasis on the need for further research should make the audience feel the urgency and importance of the topic (Feng, 2024).

Despite the widespread use of BIA devices, their accuracy can be influenced by factors such as hydration status, meal scheduling, and physical activity. For example, research on older adults found that multi-frequency BIA equipment provided favourable estimates of body composition. However, it recommended the development of correction equations to reduce errors in body fat percentage and fat-free mass estimates (Silva et al., 2019). A study by Lima et al. (2020) also emphasised that these devices might produce less accurate results in populations with a wide range of body types, including athletes, where deviations in fat mass and muscle mass measurements may occur. These findings suggest that while BIA devices are practical for body composition assessments, their limitations should be considered, especially in athletic populations where precise measurements are crucial (Santos et al., 2020).

The aim of this study is to assess the validity of two types of OMRON body composition analysers (BF 511 and VIVA) compared to the InBody 270 in karate athletes. It is hypothesised that there will be significant correlations between used measuring devices. This study seeks to provide insights into the applicability of OMRON body composition analysers in sports settings and explore the potential deviations while assessing body composition parameters such as body fat and skeletal muscle mass percentage. The findings of this study, which will be crucial for the field of sports science, have the potential to significantly impact the use of BIA devices in sports settings and ensure the reliability of the data used for training and nutrition interventions (Lima et al., 2020).

Methods

Participants

This study employed a unique cross-sectional research design, a rarity in body composition analysis studies. The sample, comprising 47 participants (Age = 16 ± 5.99 years; Body mass = 158 ± 14.13 cm; Body weight = 51 ± 17.29 kg), was carefully balanced with 20 males and 27 females. All participants were actively involved in Karate, with training

and competing experience over 5 years minimum, and they were all healthy (no illness or injuries) and rested. Participants were recruited voluntarily and were provided with comprehensive information about the study's purpose, procedures, and potential risks. The written informed consent, a cornerstone of ethical research, was obtained from each individual, ensuring that the study adhered to the highest ethical standards. The study is performed following the Declaration of Helsinki and the Ethical Guidelines of the Faculty of Sport and Physical Education.

Measuring Procedures

The validity of two OMRON body composition analysers (OMRON Healthcare Inc., Osaka, Japan) and their outputs were compared with those obtained using the InBody 270 (In Body Co. Ltd., Seoul, South Korea) analyser, which served as the reference method or 'gold standard'. Each participant underwent assessment with all three devices (randomly assigned) under meticulously standardised conditions, ensuring the consistency and comparability of the data.

All measurements were conducted in the morning during the summer karate camp organised by the Fudo Kan Karate Association. Anthropometric measurements included body height (cm), which was obtained using a standardised stadiometer. Measurements were performed in the morning under fasting conditions to minimise the potential influence of recent food intake and hydration status on the outcomes. Participants were instructed to refrain from consuming alcohol or caffeine and engaging in any vigorous physical activity for at least 24 hours before the assessment to ensure optimal standardisation and accuracy of the collected data. All measurements were performed following the manufacturer's recommendations and previous studies (Stojanović et al., 2017; Toskic et al., 2024). Measurements were performed by experienced personnel.

Statistical Analyses

Descriptive statistics were calculated for all measured variables, including average value (Mean), standard deviation (SD), minimum (Min) and maximum values (Max), and coefficient of variation (CV%). The validity level of the OMRON devices was determined using Pearson's correlation coefficient (r) based on comparisons with InBody 270 results. The coefficient of determination (r^2) and its equation were also reported on scatter plots to express the proportion of shared variance between devices. The strength of the correlation coefficients was interpreted following the classification proposed by Hopkins et al. (2015): trivial (< 0.1), small (0.1), moderate

(0.3), high (0.5), and extremely high (0.9). Statistical analysis was performed in SPSS 19 (IBM, New York, USA) while figures were created in Python (Delaware, USA).

Results

Descriptive statistics parameters (Mean, SD, Min, Max, and cV%) for all variables (BM, BF, and SMM), measured via three different BCA (InBody 270; Omron BF 511 and Omron Viva), are displayed in Table 1. It can be noticed that In Body 270 showed the lowest values of BM (51.35 kg) and highest values of SMM (42.53 %), BF 511 showed the highest values of BM (52.01 kg) and lowest values of BF (20.13 %), while VIVA showed the highest values of BF (24.12 %) and lowest values of SMM (33.83 %). Based on the cV indicator, it can be concluded that this group of participants was homogen regarding body composition parameters (26.85 %, on average).

Table 1. Descriptive statistics of three BCA (InBody 270, Omron BF 511, Omron VIVA) of BM, BF and SMM variables

	Variables	Mean	SD	Min	Max	cV%
InBody 270	BM (kg)	51.35	17.29	25.80	99.40	33.68
	BF (%)	21.03	8.15	8.60	41.70	38.75
	SMM (%)	42.53	4.73	31.81	52.01	11.12
Omron BF 511	BM (kg)	52.01	17.21	26.60	98.40	33.09
	BF (%)	20.13	7.73	7.10	40.00	38.39
	SMM (%)	35.13	4.46	18.60	43.50	12.70
Omron VIVA	BM (kg)	51.87	17.15	25.70	99.00	33.07
	BF (%)	24.12	7.75	6.20	41.40	32.14
	SMM (%)	33.83	2.96	30.80	38.10	8.76

Legend: BCA - body composition analyzer; Mean - average value; SD - standard deviation; Min - minimal value; Max - maximal value; cV% - coefficient of variation; BM - body mass; BF - body fat; SMM - skeletal muscle mass

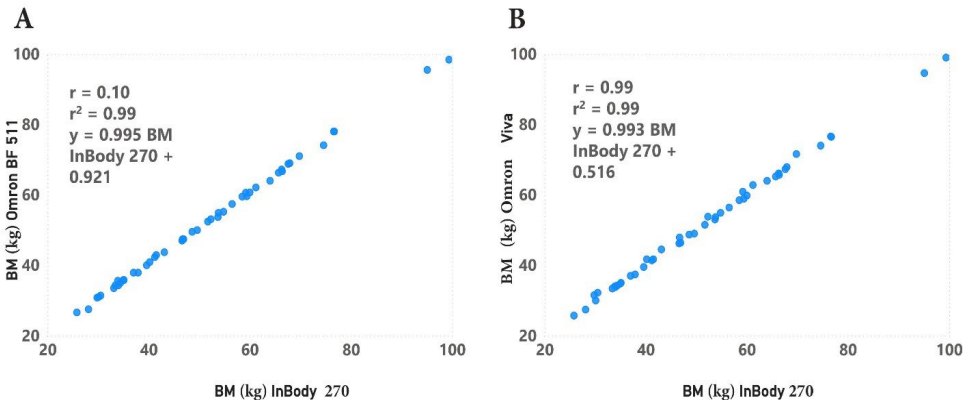
Table 2 and Figures 1, 2, and 3 present the results of Pearson's correlation coefficient, that is, the correlation between BM, BF and SMM parameters of three measuring devices for assessment of body composition. It can be concluded that there is a significant correlation in all measured parameters ($r=845$, $p=0.000$, on average), except the SMM parameter between InBody 270 and Omron Viva ($p=-0.325$, $p=0.529$).

Table 2. Correlation matrix of analysed variables assessed with different body composition scales (BCA)

		BM Omron BF511 (kg)	BM Omron Viva (kg)	BF Omron BF511 (%)	BF Omron Viva (%)	SMM Omron BF511 (%)	SMM Omron Viva (%)
BM InBody 270 (kg)	r	1.000**	.999**				
	p	0.000**	0.000**				
	N	47	47				
BF InBody 270 (%)	r			.918**	.633**		
	p			0.000**	0.000**		
	N			47	47		
SMM InBody 270 (%)	r					.679**	-0.325
	p					0.000**	0.529
	N					47	47

Legend: BM InBody 270 - body mass measured via Inbody 270 BCA; BM BF511 - body mass measured via Omron BF511 BCA; BM Omron Viva - body mass measured via Omron Viva; BF InBody 270 - body fat measured via Inbody 270 BCA; BF BF511 - body fat measured via Omron BF511 BCA; BF Omron Viva - body fat measured via Omron Viva; SMM InBody 270 - skeletal muscle mass measured via Inbody 270 BCA; SMM BF511 - skeletal muscle mass measured via Omron BF511 BCA; SMM Omron Viva - skeletal muscle mass measured via Omron Viva; r - correlation coefficient; p - statistical significance; N - number of cases, ** - significant at level $p<0.01$

Figure 1. Correlation in BM – In Body 270 vs OMRON BF 511 (A), In Body 270 vs OMRON VIVA (B)



The thoroughness of our measurement methods is evident in the results of r , r^2 , and the regression equation of the BM measure via InBody 270 and Omron BF 511 and between InBody 270 and Omron Viva, shown in Figure 1. In both cases, r ($r=0.10$; $r=0.99$, respectively) and r^2 ($r^2=0.99$; $r^2=0.99$, respectively) achieved a high correlation.

Figure 2. Correlation in BF – In Body 270 vs OMRON BF 511 (A), In Body 270 vs OMRON VIVA (B)

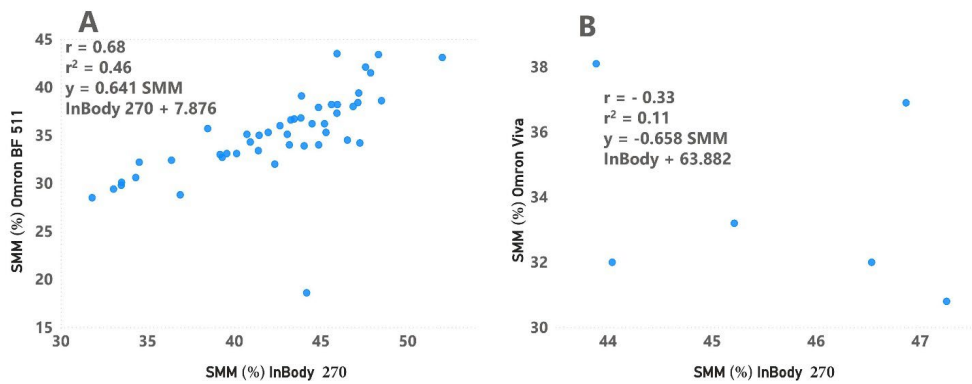
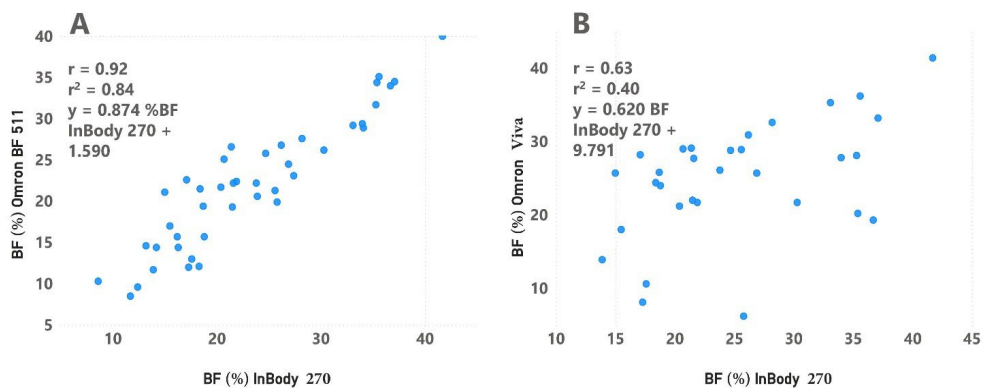


Figure 2 illustrates the results (r , r^2 , and regression equation) of the parameter used to estimate body fat (BF), which was measured with InBody 270, Omron BF 511, and Omron Viva. It is worth noting that a high relationship was recorded between BF estimated with InBody 270 and Omron Viva ($r=0.63$; $r^2=0.40$), a finding that piques our interest and invites further exploration. Furthermore, r achieved a high association between BF measured with InBody 270 and Omron BF 511 ($r=0.92$; $r^2=0.84$).

Figure 3. Correlation in SMM – In Body 270 vs OMRON BF 511 (A), In Body 270 vs OMRON VIVA (B)



Finally, Figure 3 showcases the SMM variable's r , r^2 , and regression equation measured with InBody 270, Omron BF 511, and Omron Viva. The association between InBody 270 and Omron BF 511 of the SMM variable was high, a significant finding ($r=0.68$; $r^2=0.46$). Equally intriguing, a non-significant inverse correlation was recorded between InBody 270 and Omron Viva for the same variable.

Discussion

This research aimed to assess the validity of two types of OMRON BIA (BF 511 and VIVA) compared to the InBody 270 in karate athletes. Generally speaking, it was expected that the present findings would provide insights into the applicability of OMRON body composition analysers in sports settings and discover the potential misfunctions with measuring body composition parameters such as body fat and skeletal muscle mass percentage. To our knowledge, this is the first study that has explored the validity of two different OMRON BIA, when compared with InBody 270.

The results have shown a high correlation between almost all applied parameters of three different body composition analysers. However, there are slight deviations of OMRON body composition analysers when they were compared to the widely used "golden standard" InBody 270. Firstly, variable BM (i.e., body mass) was assessed with two OMRON BIA and compared with the results of InBody 270. Results have shown that OMRON BIA was almost perfectly correlated with InBody 270 (BF511: $r=0.10$, $r^2=0.99$; Viva: $r=0.99$, $r^2=0.99$). In the case of the variable BF (i.e., body fat), the association was slightly different. OMRON BF511 and InBody 270 accomplished extremely high values of correlation coefficient ($r=0.92$, $r^2=0.84$), while OMRON Viva and InBody 270 achieved high correlation ($r=0.63$, $r^2=0.40$). Finally, when it comes to SMM (i.e., skeletal muscle mass), the proportion of the same variance between OMRON BF511 and InBody 270 was 46% with high correlation ($r=0.68$, $r^2=0.46$), and OMRON Viva and InBody 270 were inversely and non-significantly associated ($r=0.33$, $r^2=0.11$). These results unequivocally indicate that OMRON BIA are not aligned with InBody 270 when it comes to estimating BF, and especially SMM. It must be highlighted that there are evident precision differences between the two OMRON body composition analysers, as OMRON BF511 was more precise than OMRON Viva in the case of BF and SMM parameters.

Recent studies confirm the importance of body composition for karate athletes, as morphology plays a crucial role in their performance. These athletes tend to exhibit lower body fat percentages and higher lean body mass when compared to athletes from other sports, which aligns with the need for high levels of speed and strength.

For instance, a study by Genton et al. (2017) found that karate practitioners generally possess an optimal balance of muscle mass and body fat, enabling them to perform high-intensity movements required for competition. Similarly, Gaba et al. (2015) highlighted that the differences in body composition between athletes in combat sports and those in non-combat disciplines are often linked to the necessity of rapid, explosive actions in combat sports.

Body composition measurement is vital for understanding the physiological condition of athletes, including karate practitioners. Methods such as BIA are commonly used due to their ability to provide quick and reliable estimates of fat mass and lean mass. Research has shown that BIA is a practical tool for monitoring body composition in combat sports, as it accurately reflects changes in fat and muscle distribution, which are critical for optimising performance (Thurlow et al., 2017). For example, Leahy et al. (2012) demonstrated that BIA is highly correlated with more precise methods such as dual-energy X-ray absorptiometry (DEXA), which is considered the gold standard for body composition assessment.

The use of BIA in karate athletes has proven beneficial for monitoring muscle mass and fat percentage, providing valuable insights into their readiness for competition. Furthermore, BIA can assess body water distribution, which is an important aspect of an athlete's hydration status. In combat sports, where fluid balance directly impacts performance, monitoring body hydration and composition is crucial for ensuring optimal results during training and competitions (Waki et al., 1991). Studies like those by Stewart et al. (1993) indicate that BIA is not only effective in measuring fat mass but also in tracking changes in muscle mass and hydration levels during intense training cycles, making it a useful tool for sports nutritionists and trainers.

Recent research conducted in 2021 emphasised the value of BIA in tracking body composition changes during training periods. It showed that BIA is a reliable and efficient method for assessing lean mass and fat percentage in karate athletes, supporting the idea that maintaining an optimal balance of these components is essential for achieving peak performance (Stewart et al., 1993). However, the study also acknowledged potential sources of error when using BIA, particularly in athletes with high training volumes or low body fat levels, suggesting the need for careful interpretation of results.

The main limitation of the research is the unavailability of reliability, as we didn't carry out an examination of within-day and between-day reliability. Also, this type of study should be repeated on different subjects regarding age and training status, which could contribute to the generalisation of the present results.

Conclusion

The results have shown a high correlation between almost all applied parameters of three different body composition analysers. However, there are slight deviations of OMRON body composition analysers when they were compared to the widely used “golden standard” InBody 270. Further studies are required, with different samples of participants, in order to generalise the results observed in this study.

Conflict of interests:

The authors declare no conflict of interest.

Author Contributions:

R.A. and L.T.; Resources, R.A. and V.S.; Methodology, R.A. and V.S.; Investigation, R.A., N.U., L.M., M.M. and N.A.; Data curation, M.M.; Formal Analysis, L.T. and V.S. Writing – original draft, R.A., L.T., N.U., L.M., M.M., N.A. and V.S.; Writing – review & editing, R.A. and L.T. *All authors have read and agreed to the published version of the manuscript.*

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CONNECTION BETWEEN JOB DEMANDS AND BURNOUT AND QUALITY OF LIFE AMONG SOCIAL WORKERS IN SERBIA

Ivana Zubić ¹

Abstract: Social workers are at a higher risk of work-related stress, burnout, and a lower quality of life compared to the general population and other health professionals. This is why it is important to examine factors and consequences of burnout among social workers. The aim of the study was to investigate connection between job demands (workload, emotional demands) and burnout and quality of life among social workers in Serbia. The Job Demands–Resources explanatory model of burnout was the theoretical framework of the study. The sample population consisted of 102 social workers working in Serbia. The aim of the study was tested with the use of tools measuring job demands (Workload scale and Scale of emotional demands), job burnout (Copenhagen Burnout Inventory), and quality of life (WHOQOL-BREF). Job demands were negatively related to quality of life, and positively related to burnout. In addition, burnout was negatively related to quality of life. The results support the notion of the Job Demands-Resources model and provide further insight into energetic process in which high job demands lead to burnout and health problems.

Keywords: Job Demands-Resources Model, Social workers

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Introduction

Social workers are committed to the protection and empowerment of populations at risk; they help these populations improve their physical and mental well-being within a society characterized by great economic inequality and a high potential for vulnerability (Bateman, 2002). However, the high demand for their services and functioning in emotionally intense environments with limited resources - can present significant challenges for social workers (Tartakovsky, 2016, Lloyd, King, Chenoweth, 2002). Due to the stressful conditions of their work, social workers are vulnerable to burnout.

Burnout was initially defined by Freudenberger (1974) as a phenomenon found among professionals who experience intense contact with their clients and who express an inability to cope with stressors at work. Freudenberger (1974, 1980) described their conditions as including fatigue, depleted physical and mental strength, and a sense of being worn out as a result of exaggerated goals and unrealistic expectations imposed by the workers themselves or by the society.

Today, the most widely accepted definition of burnout is that suggested by Maslach and her colleagues who define burnout in human services work as a prolonged response to chronic emotional and interpersonal stressors on the job (Maslach, Schaufeli, Leiter, 2001). Job burnout is a psychological syndrome composed of three dimensions: emotional exhaustion, depersonalization, and reduced personal accomplishment (Maslach, Schaufeli, Leiter, 2001). Exhaustion refers to feelings of strain, particularly chronic fatigue resulting from overtaxing work. Depersonalization refers to an indifferent or a distant attitude towards work in general and the people with whom one works, losing one's interest in work and feeling for work has lost its meaning. Reduced professional accomplishment refers to reduced feelings of competence, successful achievement, and accomplishment both in one's job and the organization.

This increased individual responsibility for work, combined with high workload and job demands and insufficient resources, have been found to be an important reason for burnout of social workers (Lizano, Mor Barak, 2012, Astvik, Melin, 2012). Research suggests that social workers are at a higher risk of work-related stress, burnout, and a lower quality of life compared to the general population and other health professionals (Lloyd, King, Chenoweth, 2002). The consequences of burnout are potentially very serious for social workers, their clients, and service agencies. Burnout of social workers may increase susceptibility to chronic diseases, such as physical and mental health conditions, and reduce overall quality of life (National Association of Social Workers, 2016). The literature suggests that social workers experiencing

burnout have an increased risk of depression (Evans, Huxley, Gately, Webber, Mears, Pajak, 2006, Siebert, 2004, Stanley, Manthorpe, White, 2007), and physical health problems (Kim, Ji, Kao, 2011). Studies showed that symptoms of burnout result in their impersonal treatment of service users, and undermine the quality of their performance and the effectiveness of their interventions (Deckard, Meterko, Field, 1994, Gaba, Howard, 2002). Studies also showed relationship between burnout of social workers and job satisfaction (Lizano, Mor Barak, 2015, Smith, Clark, 2011, Hombrados-Mendieta, Cosano-Rivas, 2011) and increased turnover (DePanfilis, Zlotnik, 2008, Williams, Nichols, Kirk, Wilson, 2011, Kim, Solomon, Jang, 2012, Kim, Stoner, 2008, Mor Barak, Nissly, Levin, 2001).

This study examined predictors and consequences of burnout among social workers in Serbia. This research examined the relationship between job demands, burnout and quality of life among social workers.

The Job Demands–Resources Model

This study is contextualized within the Job Demands - Resources (JD-R) explanatory model of burnout. According to the JD - R model (Bakker, Demerouti, Boer, Schaufeli, 2003, Demerouti, Bakker, Nachreiner, Schaufeli, 2001), every occupation may have its own specific risk factors associated with burnout, these factors can be classified into two broad categories of work characteristics: job demands and job resources.

Job demands refer to those physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological (i.e., cognitive or emotional) effort and are therefore associated with certain physiological and/or psychological costs (Demerouti, Bakker, Nachreiner, Schaufeli, 2001). Although it has been suggested that job demands might measure the challenges in work rather than the stressful aspects (Steenland, Johnson, Nowlin, 1997), job demands may become stressors in situations which require high effort to sustain an expected performance level, consequently eliciting negative responses, including burnout. Job resources refer to those physical, psychological, social, or organizational aspects of the job that may 1. reduce job demands and the associated physiological and psychological costs, 2. are functional in achieving work goals, and 3. stimulate personal growth, learning, and development. A lack of job resources may have negative effects on employees' well-being, that is, increase levels of burnout.

A second proposition of JD-R theory is that job demands and resources instigate two very different processes: 1. an energetic process of wearing out in which high job demands exhaust employees' mental and physical resources and may therefore lead to

burnout, and eventually to ill health; and 2. a motivational process in which job resources foster work engagement which in turn leads to positive organisational outcomes (Schaufeli, Bakker, 2004). Taken together, the JD-R model proposes that high job demands and a lack of job resources form the breeding ground for burnout and for reduced work engagement, respectively.

The energetic process from high job demands through burnout to ill health can be illuminated using Hockey's (Hockey, 1997, 2000) compensatory regulatory-control model. According to this model, employees under stress face a trade-off between the protection of their primary performance goals (benefits) and the mental effort that has to be invested in the job (costs). When job demands increase, regulatory problems occur; that is, compensatory effort has to be mobilized in order deal with the increased demands and to maintain performance levels, and this is associated with physiological and psychological costs (e.g., increased sympathetic activity, fatigue, loss of motivation). Continuous mobilization of compensatory effort drains the employee's energy and might therefore lead to burnout and, in the long run, to ill health (Hockey, 2000, Frankenhaeuser, Johansson, 1986, Gaillard, 2001).

The aim of study (Zubić, 2022) was to examine the relationship between elements of the JD-R Model in a sample of teachers from the Republic of Serbia. The sample consisted of 119 teachers who have been working in primary and secondary schools. The results showed statistically significant correlations between work overload and emotional demands, on the one hand, and burnout and job commitment, on the other hand.

Statistically significant correlations were found between colleague support and supervisor support, on the one hand, and burnout and job commitment, on the other hand. A statistically significant negative correlation was found between burnout and job commitment, The results confirmed the assumptions of the JD-R model, the energetic process of exhaustion, i.e. the effect of job demands (job overload and emotional demands) on burnout, as well as the motivational process, the effect of job resources (social support from colleagues and supervisors) on job commitment.

Several studies conducted in the context of the JD-R model have found that job burnout mediates the relationships between different types of job demands and ill health. For example, the research conducted by Hakanen et al. has indicated that job burnout mediated negative impact of job demands on self-rated mental problems in a group of Finnish teachers (Hakanen, Bakker, Schaufeli, 2006). Mediating function of the job burnout was supported also in study, in which emotional demands, quantitative workload and poor working conditions led to depression through increasing high job burnout in the group of dentists (Hakanen, Schaufeli, Ahola, 2008). In the

Dutch study on workers of service organizations, Schaufeli and Bakker (2004) have found that workload and emotional demands lead – through a high job burnout – to psychosomatic symptoms, including headaches, cardiovascular problems and gastric problems. Results the study on Polish teachers (Baka, 2015) showed that the negative impact of job demands on mental and physical health were mediated by the increasing job burnout (Penezić, 2021).

Results of the longitudinal study (Lizano, Mor Barak, 2012) on the sample of public child welfare workers confirmed assumptions of JD-R model. Therefore, it was confirmed the impact of workplace demands and resources on the development of emotional exhaustion and depersonalization. This research is an attempt to verify the JD-R model of burnout in Serbian conditions. The central aim of the present study is to examine connection between job demands and burnout and quality of life among social workers in Serbia.

Based on previous empirical findings on job burnout among employees and social workers, the theoretical postulates of Job Demands–Resources model of job burnout, this study tests the following hypotheses:

H1. Job demands (workload, emotional demands) are positively correlated to burnout

H2. Job demands (workload, emotional demands) are negatively correlated with quality of life

H3. Job burnout is a negatively correlated with quality of life

Methods

Sample

Ten social services departments from different cities in Serbia were originally approached. Due to a variety of reasons only six were able to co-operate in the study. Having obtained permission from the six respective Directors of Social Services, team leaders and social workers were asked for co-operation in filling in the research questionnaire. In some cases, by request, the researcher attended staff meetings to administer the questionnaire. In other cases, respondents were handed the questionnaire (and a covering letter) by their team leader and asked to return it, completed, in a sealed envelope direct to the researchers or to an agreed collection point. The confidentiality of the answers was emphasized. In this way, a total of 150 questionnaires were distributed and 106 were returned, and 102 were fully completed and used for the data analysis purposes.

The sample population consisted of 102 social workers working in Serbia. The sample included 16 men (15,7%) and 86 women (84,3%). Respondent age ranged from 24 to 63 with a mean sample age 38.73 (SD=10.67). Agency tenure in the sample ranged from a one year to 37 years with an average tenure of 12,08 (SD=9,872). Average weekly working time of the participants was 41,95 (SD=4,28).

Measures

Job demands. Two job demands were included in the present research: workload and emotional demands. Workload represents a job demand consistently found to be a major predictor of burnout (Schaufeli, Enzmann, 1998, Lee, Ashforth, 1996). Workload was measured with the Workload scale (Shirom, Nirel, Vinokur, 2010). Respondents rated their workload using a five-point scale that ranged from 1 (Do not agree) to 5 (Very much). The nine-item measure included items gauging quantitative overload (worked too many hours), and qualitative overload (found it difficult to divide his or her available time between work and family). Cronbach's Alpha of this scale is 0.88.

Emocional demands was assessed with scale Emotional demands from The Job Demands - Resources Questionnaire (Bakker, 2014) and included six items (e.g., Is your work emotionally demanding?). High scores on scale indicate high emotional demands. Items were scored on a scale ranging from (1) "never" to (5) "very often". Cronbach's Alpha of this scale is 0.77.

The job burnout was measured with Copenhagen Burnout Inventory (CBI). The CBI is a public domain questionnaire and consists of three scales measuring personal burnout, work-related burnout, and client-related burnout. Burnout is a state of prolonged physical and psychological exhaustion (nineteen items; e.g., How often do you feel tired?). High scores indicate high burnout. Items were scored on a scale ranging from (0) "never" to (4) "always". Cronbach's Alpha of this scale is high 0.92

The quality of life was measured with The World Health Organization Quality of Life- WHOQOL-BREF (The WHOQOL Group, 1996). Quality of life is defined as individuals' perceptions of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. WHOQOL-BREF contains 26 items (e.g., To what extent do you feel your life to be meaningful?) and covers four different domains of quality of life: physical health, psychological health, social relationships and environmental domain. Each individual item of the WHOQOL-BREF is scored from 1 to 5 on a response scale, high scores indicate high quality of life. Cronbach's Alpha of this scale is 0.82.

Statistical analysis

IBM SPSS Statistics v. 21 was used for data processing. Among the descriptive parameters, the arithmetic mean and standard deviation were used, and in order to register connection among variables, correlation was conducted. The level of significance is $p < .05$.

Results

Table 1. shows the means, standard deviations, and correlations between the variables.

Table 1. Descriptive statistics and correlations of the study variables

Variables	Mean	SD	1	2	3
1. Workload	3,56	,79	1		
2. Emotional demands	3,27	,61	0.61***	1	
3. Burnout	3,24	,69	0.59***	0.63***	1
• 4. Overall Quality of Life	3,52	,62	-0.42***	-0.44***	-0.57***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

All the significant relationships between the variables were in the expected direction. Job demands were negatively related to quality of life, and positively related to burnout. In addition, burnout was negatively related to quality of life.

Discussion

The JD-R model has been the theoretical framework of the study. The aim of the current study was to study connection between job demands and burnout and quality of life among social workers in Serbia. First, the findings indicate a positive relationship between job demands and burnout. This is consistent with previous empirical studies examining the relationship between job demands and job burnout (Steenland, Johnson, Nowlin, 1997, Upadyaya, Vartiainen, Salmela-Aro, 2016, Xanthopoulou, Bakker, Demerouti, Schaufeli, 2007). Results of this study showed negative relationship between burnout and quality of life. The findings also indicate a negative relationship

between job demands and quality of life among social workers which is congruent with the theoretical understandings (National Association of Social Workers, 2016).

This is consistent with previous empirical studies examining the mediating role of burnout in the relationship between job demands and ill health (Hakanen, Bakker, Schaufeli, 2006), and depression (Hakanen, Schaufeli, Ahola, 2008), mental and physical health problems (Baka, 2015) and psychosomatic symptoms, including headaches, cardiovascular problems and gastric problems (Schaufeli, Bakker, 2004).

This study lends support to the JD-R model in predicting burnout among social workers. This is consistent with previous study among public child welfare workers which also confirmed JD-R model of burnout development (Lizano, Mor Barak, 2012).

It should be also noted that this research contains certain limitations which weaken its external validity and call for caution in the interpretation of the results.

Because of the cross-sectional design of the current study, the postulated relationships between job demands and burnout dimensions cannot be interpreted causally. Nevertheless, longitudinal studies and quasi-experimental research designs are needed to further validate the hypothesized causal relationships in the JD-R model. Both job burnout and quality of life are usual dynamic processes which evolve being subjected to a long-term impact of job demands therefore it is crucial to reflect their gradual development. This can be achieved only through longitudinal research with a several month break between test and retest.

Unequal sex ratio in the sample with 84,3% female participants is one of the limitations. The data may apply to men to a lesser extent. What is more, the research has taken into consideration only one (and quite specific) occupational group – social workers. Job resources have not been taken into account in the presented analyses but their beneficial functions are distinctly emphasized by the authors of the JD-R model. Numerous studies have concluded that job resources may buffer the adverse impact of job demands on poor health (Bakker, Demerouti, Taris, Schaufeli, Schreurs, 2003).

Job demands play a central role in the hypothesized energetic process that might lead to burnout and health problems, but also to potential negative organizational outcomes such as the intention to leave the organization. Study results can help inform management strategies for the prevention of job burnout development among social workers. Our results indicate that organizations of social work should aim to decrease job demands when feasible. Many organizational based strategies exist to tackle high job demands, such as job redesign, flexible work schedules, and goal setting (Quick, Quick, Nelson, Hurrell, 1997). Since burnout plays a key role in

the model, individual-based interventions to reduce burnout symptoms might also be an avenue to explore (Schaufeli, Enzmann, 1998). The meta-analysis (Van der Klink, et al., 2001) showed that particularly stress management programs that use a cognitive behavioral approach are effective in reducing stress reactions, including burnout. Clearly, such individual-based programs should be supplemented by organization-based programs in order to be effective in the long run. We hope that with the proposed model we have contributed to a better understanding of burnout traditional issue in occupational health psychology.

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SPORTS JOURNALISTS CONFRONTING CYBERBULLYING BEHAVIOR AND PROPOSED SOLUTIONS

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Abstract: Sports journalists are penalized by laws and regulations when they express opinions in an unacceptable manner, but there is no protection when they share logical opinions and face bullying on social media platforms. With this context in mind, we aim to examine the effects of cyberbullying on professionals in the field of sports media. The study is organized into three key sections: the first introduces a framework for understanding cyberbullying, the second provides a comprehensive explanation of sports media along with a theoretical framework for the issues raised, and the third focuses on the bullying of sports media professionals and suggests proposed solutions to overcome this challenge.

Keywords: cyberbullying, media work, sports media, sports journalists

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Introduction

In recent years, the phenomenon of cyberbullying has become widespread across the internet and social media platforms. It seeks to harm, damage, and attack others, driven by motives such as revenge, jealousy, and other personal reasons that compel individuals to exploit all means and methods to harm others. Initially, this behavior, also known as "cyber-aggression," was prominent in school environments but has spread due to the excessive and irrational use of modern technology. It is now accessible to people of all ages, making its effects especially harmful for children and adolescents.

Technological advancements and the advent of the internet have deeply impacted many aspects of daily life, leading to serious consequences for individual behavior and interpersonal relationships. This development has also resulted in major changes in the way we communicate, giving rise to new forms of deviant behavior and evolving traditional patterns of misconduct. Modern communication tools and mobile applications have played a major role in spreading these behaviors, particularly among children and young adults, who are the most frequent users of the internet.

Cyberbullying, a form of aggression that originally emerged in schools, has now found a significant presence in the online world. It has transitioned from traditional bullying to cyberbullying, becoming a pressing issue that requires in-depth study and analysis of its causes and effects. Today, media and communication channels dominate our attention, surrounding us at all times and exposing us to the content we watch, hear, and read daily. In the realm of sports, numerous studies have highlighted how sports media can foster violent and aggressive behaviors in their consumers when these platforms are exploited negatively, without regard for legal guidelines. Instead of contributing to social and sports education, raising awareness about the psychological, social, and intellectual benefits of sports, and encouraging widespread participation, these media often propagate violence and aggression through sensational content, focusing on mistakes in sports, provocative statements, and inciting conflict. As a result, they spread values of aggression and bullying among the public. Even those working in the sports field have not been spared from this issue, and it has significantly impacted the work of sports media professionals, causing them to face challenges and difficulties instead of benefiting from the technology that was intended to simplify their work.

- From this, the following question arises: How can a sports journalist confront cyber-bullying from the public?

And the sub-questions are as follows:

- What is meant by cyberbullying and sports media?
- What are the elements, manifestations, and causes of cyberbullying among sports media professionals?
- What are the proposed solutions?

Cyberbullying

Definition Of Cyberbullying

Definition of Bullying: A person being repeatedly subjected to negative behaviors over a period of time by one or more individuals.

Abu Al-Ghazali defines it as: "A deliberate and repetitive behavior directed at one or more individuals involving physical harm, verbal abuse, humiliation, or property damage, resulting from an imbalance of power" (Al-Hayari, 2018).

Cyberbullying: The term "cyberbullying" was first coined and defined by Canadian educator and anti-bullying activist Bill Belsey, who described it as: "The use of information and communication technologies to support deliberate, repeated, and hostile behavior by an individual or group, with the intention of harming others."

In another definition:

- It is an intentional, aggressive act carried out by an individual or group using electronic communication tools in a repeated and continuous manner against an individual or group unable to defend themselves.
- It is also defined as the deliberate use of electronic communication tools to inflict harm on a specific individual or group, repeatedly and consistently.
- It also refers to the violation an individual faces while online, involving fear, threats, and actions that continuously infringe on others' freedom and privacy (Al-Shammari, 2021).

According to the definitions by Trolli, Hanel, and Leishids: It is the use of electronic communication tools to intentionally cause harm to another party without direct physical contact (Al-Jiachi).

Forms Of Cyberbullying

Willard identifies that cyberbullying manifests in various forms, including:

- Hostile Messages: Refers to online confrontations using emails containing angry and vulgar language.
- Harassment: Involves sending offensive, degrading, and hurtful messages to the victim via email.
- Defamation: Sending false rumors with the intent to damage the victim's reputation.
- Impersonation: The cyberbully impersonates the victim or someone else, sending and publishing electronic content to get the victim into trouble or jeopardize their reputation.
- Disclosure of Secrets: Involves sharing personal secrets, embarrassing information, or photos over the internet.
- Exclusion: The deliberate and cruel act of excluding someone from an online group or community.
- • Cyber Harassment: Refers to repeated and intense harassment and defamation that includes threats or causes significant fear, such as hacking the victim's personal account and spreading rumors to the victim's friends, or sharing sexually suggestive images with the implication that they were exchanged with the victim personally, along with the victim's email address and mobile number (Al-Karim, 2021).

Causes Of Cyberbullying

The causes of cyberbullying can be attributed to several factors, including individual aspects related to both the bully and the victim. For the bully, they may turn to violence as a way of coping with stress and anxiety due to a lack of self-confidence. On the other hand, the victim's lack of self-confidence makes them more likely to be targeted, as they may be unable to defend themselves.

Family upbringing and parenting style also play a significant role. Lenient parenting, the failure to discipline children for their mistakes, indecision in decision-making, and disagreement between parents on methods of reward and punishment can lead to inconsistent household rules. Furthermore, harsh parenting, including physical

punishment, can contribute to the development of bullying behaviors in children, especially in school environments.

The educational level of parents also impacts the prevalence of cyberbullying. Studies have shown that lower educational levels of parents negatively affect their children's behavior at school, whether they are bullies or victims.

Schools also play a role in the spread of cyberbullying. Students and adolescents are often more active and energetic than others, and this energy should be channeled into positive activities that help develop their life and technical skills. Research has shown that a school environment that lacks activities to utilize students' free time and meet their psychological and social needs leads to students resorting to violence as a means of releasing negative emotions and psychological stress.

The influence of bad company and the desire for students to belong to specific peer groups also affects their behavior.

Additionally, violent scenes, particularly in professional wrestling and violent films, promote these behaviors, increasing the sense of power and heroism in individuals.

Lastly, video games and computer games that depict violence, shootings, and explosions also contribute to the rise of violence in schools, including bullying and cyberbullying. (Al-Karim, 2021).

Characteristics of the bully, the victim, and cyberbullying methods

Characteristics of the bully and the victim

The bully

Here, we outline some definitions that describe the bully from different perspectives. A bully is defined as "a person who repeatedly engages in actions against victims who are unable to defend themselves. This behavior can have serious negative consequences, especially for the victims over time."

It is also described as "a person who repeatedly targets another person in an organized manner, using either direct (physical) or indirect aggression. Bullies are typically older, larger, and physically stronger than their victims." The bully is characterized by the following traits:

- Power: Often derived from age, size, or gender.

- Intentional harm: The bully finds satisfaction in scolding or attempting to control the victim and escalates their actions when the victim shows discomfort.
- Duration and severity: Bullying lasts over a long period and becomes more intense with time.

Bullies are classified into two types:

- Aggressive bullies: These are the more prominent types, typically confident, impulsive, cruel, and strong. They believe aggression is the only way to maintain their power and resolve conflicts.
- Passive bullies: These individuals reinforce aggressive bullies' behavior and begin actively participating after bullying occurs. They rarely initiate aggression on their own and are extremely loyal to the bullies (Boumachta, 2021).

The victim

There are various definitions of a victim, and here we mention some of them. A victim of bullying is "a person who is repeatedly harassed or insulted by someone more powerful." It is also described as "a person whose psychological and social abilities prevent them from responding positively in situations where they are harmed or abused by others." The victim of bullying is characterized by the following traits:

- Vulnerability: The victim is easily deceived, unable to defend themselves, and has physical and psychological traits that make them more likely to be targeted.
- Lack of support: The victim feels isolated and weak and may avoid reporting bullying for fear of retaliation from the bully.
- Low self-esteem: The victim feels a sense of failure and lacks self-confidence.
- A tendency to isolate themselves and difficulty forming friendships or relationships with peers. Victims of bullying are classified into two types:
 - Passive victims: These are the majority of bullying victims, who show high levels of fear, anxiety, and caution. They do not provoke others and fail to defend themselves. They tend to withdraw, cry, and give up.
 - Provocative victims: These are a minority compared to passive victims. They tend to have a sharp temperament, are curious, show high levels of anxiety, and will seek revenge if attacked (Boumachta, 2021).

Cyberbullying methods

Cyberbullying is an extension of traditional bullying in terms of its forms, types, and motives, but the key differences arise from the increased use of computers and the internet, as well as the cultural context in which these technologies are applied. (Despite this, cyberbullying employs various methods that allow the bully to harm the victim without direct confrontation. These methods include the following:

- Phone calls, either through the phone or online, designed to intimidate the victim through insults, slander, and threats.
- Text messages, typically involving threats to expose secrets, create scandals, or attempt blackmail.
- Photos and videos, where the bully takes personal pictures and videos that the victim may have shared with friends.
- Email, where the victim may receive a malicious message. Upon clicking the link, the bully can gain access to the victim's email, including personal messages, data, and conversations.
- Web chat rooms, where the bully communicates directly with the victim from a fake account, attempting to harm them or hack into their personal account.
- Deceptive web links, where the bully shares attention-grabbing content, and when the victim clicks on it, the bully can post inappropriate news and images on the victim's page. (Boumachta, 2021).

Sports media

Definition of Sports Media

Definition of Media

Media refers to the process of communicating and informing, which means conveying information. It is said: "I informed the people with a message," meaning I delivered the necessary information to them. The Hadith says, "Convey from me even if it is a verse," meaning deliver it to others and raise awareness. It is also said that God's command is to be fulfilled, as in the verse "Indeed, God's command is always carried out," meaning it is effective and delivered as intended (Fatiha M.).

Sports Violence

It refers to the rivalry and confrontation between athletes, with supporters of each side having symbolic significance. The violence used in winning or the violence resulting from losing is often considered fanaticism.

- Ahmed Khalifi defined violence in sports stadiums between players and supporters as a source of anxiety and discomfort. It reflects a lack of civilization and an inability to accept others, often stemming from athletic failure. This is seen as an obstacle to the enforcement of laws (Radawi, 2019).

The process of spreading sports news, information, and facts, and explaining the rules and regulations governing these activities to the public.

- Sports Media: This refers to sports newspapers that provide written updates on what is happening in the sports world through consecutive editions. (Al-Nazari)
- Sports Media: This refers to various types of media that primarily serve the public, using these platforms as a means to deliver messages. The goal is to spread sports news, information, and facts, explain the rules and laws related to sports activities, and promote sports culture and raise awareness. (Others)
- Sports Media: The process of disseminating news, information, and facts about sports, explaining the rules and laws related to all games and activities to the public, with the aim of spreading sports culture and raising cultural and sports awareness (Al-Dhunaybat, 2019).

It is the process of spreading sports news, information, and facts, interpreting the rules, laws, and principles that govern sports and games, and delivering these to the public in order to spread sports culture and raise awareness. Through mass media, the goal is to influence the behavioral growth and values of the audience. (Kamal, 2020).

Elements of Sports Media

- The Sender: This refers to the person or entity responsible for the media message, whether it is the federation, the club, the athlete, or the coach, etc.
- The Receiver: This refers to the individual or group to whom the media message is directed.
- The Medium or Message: This refers to the channel through which the message is delivered, such as a newspaper, radio, television, etc.
- The Message or Content: This is what the sports media conveys to the audience. Sports media depend on the message and content they present to achieve their purpose.

eve their goals. This includes their reliance on facts, numbers, alignment with contemporary trends, appropriate artistic forms, and suitability for the audience's age and needs. Sports media are evaluated positively or negatively based on these criteria. The more these conditions are met, the greater the media's impact on the audience, earning their trust and encouraging their engagement. Based on these elements, communication theory and its psychological interpretations in sports media have been developed. (Al-Rahim, 1998)

The Role of Sports Media and Characteristics of the Media System

The Role of Sports Media

- To transfer and deliver information and facts related to contemporary sports issues and problems, and to attempt to explain and comment on them.
- To spread sports culture by introducing the rules and laws of various sports and activities, as well as any modifications or changes that may arise.
- To reinforce and maintain sports values, principles, and attitudes. Every society has a value system that influences the patterns of sports behavior, aligning with those values and principles, making conformity a defining characteristic of the society.
- To provide entertainment and recreation, offering relief and reducing the burdens of everyday life.

These are the most clear and important objectives of sports media, which aim to educate, inform, and entertain the public through the dissemination of sports news and updates, both locally and internationally.

Characteristics of the Sports Media System

- Sports media involves a significant degree of selection, as it chooses the audience it wishes to address and reach. For example, this radio sports program targets a football audience, while this sports magazine is dedicated to basketball, and so on.
- Sports media is notable for its wide reach, with the ability to cover large areas and appeal to large segments of the population.
- Sports media is characterized by its broad mass appeal, enabling it to cover vast areas and reach large groups of people.
- In its efforts to attract the largest possible audience, sports media aims for an ideal middle point where the largest number of people can gather, excluding

those targeting specific sectors, such as sports programs for the disabled, and so on.

- Through its various platforms, sports media is a social institution that responds to its operating environment due to the ongoing interaction between media and society. To understand it fully, the society in which it operates must first be studied to ensure that its sports media content does not conflict with the prevailing values and customs of that society. Sports media, therefore, functions as a mirror, reflecting the image and philosophy of that society. (Fatiha M.)

The Role and Objectives of Sports Media

The Role of Sports Media

The main function of sports media is to inform the public with accurate news, clear, truthful information, and objective facts that help shape a correct public opinion about an event, issue, or important topic in the sports world. Researchers highlight that sports journalism is no longer limited to merely reporting match results, describing, and analyzing them. Today, its role has expanded and become more comprehensive, as it plays an active and influential role in the development and spread of sports, particularly among youth. It also contributes to reinforcing human values by combating hooliganism and violence in stadiums, while promoting love and friendship between nations. The functions of sports journalism are numerous and diverse, with the most important being:

- **Media and Information:** This is the primary function of sports media, focused on delivering sports news, explaining it, and providing commentary.
- **Explanation, Clarification, and Analysis:** Offering more details and clarifying the sports events that arise in society, providing a deeper understanding of these events from different perspectives.
- **Criticism, Commentary, and Presenting Opinions:** Discussing all sports-related issues and problems within society, allowing the expression of various opinions that reflect different directions in the sports community.
- **Guidance and Direction:** This is a natural outcome of the explanation, clarification, analysis, criticism, and commentary. After presenting and interpreting information, it is crucial to guide the audience toward the correct path, ensuring the media's role remains constructive.
- **Education:** It helps transmit sports culture from one generation to another and educates younger generations about the community's sports history.

- Documentation and History: Sports media serves as a record that collects daily sports events and documents them in newspapers, providing a source of information for past and ongoing sports events.
- Investigating Corruption and Exposing Violations: In democratic societies, sports journalism acts as a watchdog for sports organizations, investigating issues and corruption in the sports community.

Objectives of Specialized Sports Media

Specialized sports media aims to achieve several goals, the most important of which are:

- Promoting sports culture by introducing the audience to the rules and regulations of various sports and activities, as well as any changes made to them.
- Reinforcing and maintaining sports values, principles, and attitudes, as each society has a value system that shapes patterns of sports behavior in line with those values, making conformity a defining feature of the society.
- Disseminating sports news, information, and facts related to contemporary sports issues, while offering explanations and commentary, enabling the public to make informed decisions. These are the clearest objectives of sports media, which seeks to raise public awareness, educate the public, and entertain them by providing sports information on both local and international levels, in addition to offering entertainment and relief from the stresses of daily life. (Belkhiri)

Cyberbullying of sports journalists

Cyberbullying in Sports Media

Cyberbullying has emerged as a growing issue in society, particularly among the younger generation. Its significance has increased with the advent of social media and modern sports media. It can be profoundly damaging to the victims who are forced to endure it, and it is felt globally across all communities. We must take action to prevent this behavior and ensure that our youth are safe in their environment, enabling them to enjoy sports and media without fear of bullying or harassment. We must be especially vigilant in protecting vulnerable individuals and ensuring that everyone is treated with respect. Sports journalists are also not immune to cyberbullying; they, too, face it in various forms. These include image defamation on social media, harassment, and derogatory comments on posts with arrogance, insults, and verbal abuse. This demonstrates that sports journalists are particularly suscep-

tible to such targeting, regardless of the motives behind these actions. (Al-Jiashi A., 2019).

The motivations behind cyberbullying vary, ranging from amusement, extortion, and a desire for fame, to behaviors driven by the goals of opposing organizations or orchestrated campaigns by media institutions to harm competitors. This results in image defamation, workplace conflicts, and a loss of trust with information sources.

Cyberbullying on social media platforms has become a growing concern for individuals' psychological stability, especially with the rising number of victims in recent years. According to a United Nations report titled "Cyberbullying and Its Impact on Human Rights" (Hackett, D.S), it was revealed that up to 7 out of 10 young people have experienced online abuse. The report also found that individuals who engage in discussions about politics and sports online are particularly vulnerable to abuse, highlighting a culture of fanaticism and a lack of respect for differing opinions. (Hackett, D.S).

Bullying in sports is driven by multiple causes, with one of the primary factors being sports fanaticism and the inability to accept differing opinions. Fans of various teams often refuse to accept criticism of their team or discuss any issues concerning it because they believe anyone who does not support their team, regardless of whether they are right or wrong, is an enemy and has no right to express an opposing opinion, even if that opinion is the truth. Sports journalists, whether working for newspapers or sports programs, are often the main victims of "cyberbullying" in the sports world. They are frequently subjected to negative actions from fanatical sports audiences (Bakri, 2017).

Proposed Solutions to Limit Cyberbullying of Sports Journalists

Cyberbullying is a new phenomenon in our society, and sports journalists, despite their status as opinion leaders, are also victims of "cyberbullying" in newspapers and sports programs. They face ongoing negative actions from fanatical sports audiences. We need to unite efforts to confront and reduce its spread, as well as update laws and develop effective solutions to address this issue. Some of the proposed solutions are as follows:

- Develop and implement a comprehensive plan involving the collective efforts of the government through relevant ministries, civil society, families, educational institutions, media, religious and cultural organizations, as well as sports organizations. This collaborative effort aims to change and develop society's culture to reject bullying and racism and contribute to building positive individuals by instilling values of cooperation, volunteerism, helping others, and accepting others (Al-Sharif, 2020).

- The government should enact legislation criminalizing bullying, imposing fines and imprisonment, and implementing a social program to address bullying in all its forms. Bullying causes psychological, verbal, physical, and electronic harm to others, leading to negative effects such as loss of self-esteem, depression, anxiety, and even suicide, as stated by UNICEF in a report (Hackett, D.S). In some cases, bullying can result in the loss of employment due to journalists' contracts with other media organizations that prevent them from defending themselves.
- It is crucial to collaborate with all sectors of society and relevant institutions, leveraging the positive role that figures in art and sports can play in raising awareness and educating the public about bullying. Additionally, media outlets should play an active role in monitoring bullying cases before they escalate and launch awareness campaigns through simplified media content that aligns with modern social responsibility.
- All institutions should consider incorporating a clause in employees' contracts that prohibits the use of language or actions constituting "bullying" and require employees to sign an ethics booklet that outlines their duties, responsibilities, and guidelines for their presence on social media platforms. This will help ensure they do not participate in bullying campaigns, which could significantly reduce the spread of bullying.
- Families play a crucial role in encouraging both children and adults to respect and accept others, regardless of their circumstances, appearances, or cultures. This effort should complement the work of educational institutions, such as schools and universities, in reducing bullying by instilling values of acceptance and respect for others.

Conclusion

In conclusion, cyberbullying is an old aggressive behavior, but its methods have evolved with modern technologies and the spread of the internet, making it a dangerous behavior. The bully operates from behind a computer screen without facing their victim directly, making it difficult to control, and its impact, particularly on the psychological and emotional aspects, is significant. This calls for the need to develop effective solutions and strategies to combat this phenomenon and reduce its spread. Cyberbullying is a hidden, non-confrontational behavior, which contributes to its rapid spread. It is essential to raise awareness about the responsible use of the internet, and teach people how to confront actions that could lead to the negative

impacts of this behavior. Cyberbullying has spread across all areas, especially in the sports sector. Therefore, we must equip the community with the necessary sports culture, knowledge, and concepts for individuals of all ages, directing them towards positive sportsmanship and distancing them from violence, fanaticism, and deviance.

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A FORM OF SECURE AFFECTIVE ATTACHMENT FOR CHILDREN WITH DEVELOPMENTAL DISABILITIES - A CONDITION FOR ADAPTATION IN A SPORTS TEAM

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Abstract: The goal of the work is to show the importance of affective attachment as an important component that defines the relationship of parents to the child, as well as its irreplaceable role in stimulating the child and overcoming certain social problems, especially in children with developmental disabilities when the child enters a new environment such as a sports team.

Children with developmental disabilities have absolute rights to be an integral part of the education system as well as sports institutions, which includes staying in sports teams with children of the typical population with the support of professionals and adapting the program to their capabilities in order to make adequate progress in the psycho-social sense.

The paper applies a theoretical analysis of the importance and characteristics of affective attachment as an inseparable characteristic of children and parents and its important role in understanding personality as the main result of this research when including children with developmental disabilities in a sports team.

Keywords: parent, child, sport

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Introduction

Affective attachment theory is one of the most important theoretical frameworks for understanding personality development. The importance of affective attachment focused on the development of behavior, the periods of development of affective behavior, personality formation, the influence of upbringing and other factors that influence and have a close connection with affective attachment are described in a large number of necessary researches and professional works.

The paper will attempt to present the aspects of affective attachment, as well as its influence, i.e. its role for adaptation in the sports team of children with developmental disabilities, through various research systematized according to empirical studies and review articles.

Theory of affective attachment

Affective attachment theorists and researchers commonly use the constructs of sensitivity and responsiveness to describe the quality of parenting that leads to the adoption of affective attachment strategies. Maternal sensitivity, which is defined as the mother's ability to respond appropriately, sensitively and quickly to the baby's signals, is an important condition for the development of a secure affective bond (De Wolff & van Ijzendoorn, 1997).

It is considered that the theory of affective attachment was created in the middle of the last century and in its interpretation it went through various stages in which psychology made a great contribution and today it is considered to be a theory about the origin and nature of human sensitivity. According to Bowlby, affective attachment refers to a specific relationship that is formed in early childhood between mother and child and lasts throughout life, as a permanent psychological bond established between two people (Bowlby, 1988).

Fraley (2002) states that affective attachment implies a special and affectionate relationship between the parents and the child, which will be essentially undisturbed but at the same time reasonable, more sensitive and stimulating for the child in synchronization with the mother so that the child feels safe and confident. In essence, mothers who are especially sensitive and connected to their child react faster to all the child's reactions, feel the child and his emotions more strongly, and therefore, looking at the child's face, they more easily interact with each other. Responsiveness implies correct interpretation of the child's signals, as well as timely and consistent

response to them. It is important for the child to get the impression that she is available through interaction with the mother and to develop positive expectations in relation to their needs. If parents are usually warm, positive and consistently available, the child will learn to count on them when he needs them, and develop secure patterns of affective attachment.

Also, in his early research, Bowlby (1973) observed individual differences in the functioning of the affective attachment system and believed that only a sincere and strong connection between parents and children, who are sensitive to all the child's feelings and reactions, leads to the formation of a pattern of secure affective attachment.

A secure affective attachment develops in a relationship with happy mothers, who have a positive attitude towards the parental role and who respond in a timely and adequate manner to the child's signals. Children with this characteristic of affective attachment, when the mother is present, certainly examine the environment, are disturbed by the mother's departure, and upon her return, they calm down and return to the game.

According to Stefanović et al. (2012), a securely attached infant is characterized by the following:

- Can rely on the mother as an available source of comfort and protection if the need arises;
- He is able to direct attachment behaviors towards his mother and to be comforted and soothed in contact with her;
- Readily explores and masters the environment.

Psychologists believe that children with developmental disabilities and children of the typical population, if in their younger years they showed a model of behavior as safe and more stable children, that this pattern of behavior will also be maintained in their older years because they are better.

Psychologists believe that children with developmental disabilities and children of the typical population, if they showed a model of behavior as safe and more stable children in their younger years, they will keep that pattern of behavior in their older years because they manage better in negative situations, have more self-confidence, are more emotionally mature and find solutions more easily. In the same situation, children who belong to patterns of insecure affective attachment react with so-called secondary strategies, which mean adaptation to specific experiences acquired through daily contact with their mother (Tošić et al., 2013).

Tošić et al. (2013) state that based on the characteristics of children's behavior, and on the basis of their formed nature of relationships, Mary Ainsworth distinguishes two types of insecure attachment in addition to secure: rejecting and ambivalent. Rejecting affectively attached children show a behavior model such that they do not react to the presence or absence of parents, especially the mother. When the mother is not present in the child's environment, the child behaves without a pattern of sadness, and in the presence, i.e. the return of the mother, they almost ignore her presence. Ambivalently attached children are disturbed by separation, reserved in communication with an unknown person, and upon the mother's return, they want her closeness and show a model of longing for the mother's presence. The aforementioned models of children's behavior are the causes of mothers not responding to children, their insufficient attachment and connection with their children, as well as insufficient presence when the child needs support and her presence. All this describes a pattern of ambivalent affective attachment.

Children with developmental disabilities

Searching the professional literature, there are a large number of definitions of "developmental disabilities" that are adapted to different contexts and situations in which they are applied. Developmental disabilities can represent a social construct because the environment sometimes sees them as a problem because this population is the first to notice what they cannot do. The inclusion of these children in sports content changes the attitudes and opinions of the environment because a person with a developmental disability can show his hidden potentials and abilities through sports activity (Milićević Marinković, 2020).

The starting point for a set of individual and social activities for children with physical or mental disabilities is contained in the text of the UN Convention on the Rights of the Child and reads: "A child with developmental disabilities is a child with a need for special care, and a child with special care is a child." It is clear from the documents created by the elaboration of the Convention that in the search for improving the quality of life of every child, including a child with a disability, one should look for ways that would help meet their human needs. To this general set of human needs should be added those that are really special (such as, for example, the need for orientation in space in children who have difficulties with vision) (Mitić, 2011). Certain neurological conditions such as cerebral palsy can interfere with the child's emotional and verbal expressiveness, and parents fail to interpret the child's signals. Thus, the child's distraction, especially those conditions that affect the child's

communication, represents a specific challenge to the parent's ability to respond to the child's unclear signals (Walden, 1996).

Namely, parental/guardian figures provide the child with security by providing sensitive responsiveness, protection, comfort and providing a secure base from which children conduct further research (Ainsworth et al., 1978 according to Clements & Barnett, 2002). This is where the importance of establishing an affective relationship lies, as research has shown its connection with the subsequent social, emotional and behavioral development of the child (Lyons-Ruth, Easterbrooks, & Cibelli, 1997).

Adaptation of children with developmental disabilities to the sports team

The notion of a secure base is one of the central terms of affective attachment theory. When we talk about a safe base, we are talking about the conditions that the figure of affective attachment creates so that the child (or another person who is affectively attached to him) feels safe enough to explore new spaces, roles or relationships. It is considered that a secure base represents the quality of interaction with a preferred person, which contains support and the possibility of independence, as well as a sense of psychological closeness as a prerequisite on the basis of which the interaction is maintained (Heord and Lake, 1986).

When the process of adaptation of children with developmental disabilities in a sports team takes place, it depends on a large number of factors such as: the child's individual characteristics, age, state of health, i.e. form of disability or developmental disabilities, attachment to parents, most often the mother, general living conditions from which the child comes, fear, etc. An important role in this process of adaptation is played by the mother because she gives the child the feeling of being safe and accepted.

Marvin & Pianta (1996) state that when the resolved guardian system of the parent is activated by the child's affective relationship behavior or some perceived threat to the child, the parent has a relatively integrated representational model of himself and his child, and is able to adequately direct his guardian behavior by properly sensing the child and his needs and applying an adequate model of behavior and timely reactions in order to help the child and fulfill his parental task or role in full capacity.

According to Stojić et al. (2010), numerous results indicate that the early pattern of affective attachment can predict later behaviors, of which for early social development, among the most significant is the prediction of adaptation to kindergarten -

among other things - relationships with peers (Wood et al., 2004), or the teacher (Cugmas, 2004). From the point of view of affective attachment theory, by starting kindergarten, the child gets a chance to change the figure of affective attachment and to achieve attachment to the teacher, qualitatively different from the pattern he achieved with his mother, thanks to the innate, adaptable mechanism of affective attachment. The nurse-educator potentially becomes a figure to whom the child becomes attached, which gives the child a learned and safe base from which to explore, learn and participate in activities (Stojić, Divljan, Avramov, 2010). All these interpretations can also be applied to the child's adaptation to the sports team.

Children with biologically based disorders that significantly disrupt their social functioning (eg, autism) establish an affective bond with their parents (Capps, Sigmann, & Mundy, 1994; Oppenheim et al., 2009). Parental responsiveness and sensitivity have a positive impact on the development and well-being of all children, when a child has a disability or developmental delay, parental protection and sensitivity can be even more important for their survival and progress (Barakt & Liney, 1992; Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). Children with damage to the central nervous system may exhibit unusual behavior, making it difficult for the parent to understand and respond appropriately in the situation. Also, children with developmental disabilities cannot always provide the stimuli and responses necessary to support sensitive interaction with their parents (Moran et al., 1992 according to Atkinson et al., 1999; Sayre, Pianta, Marvin, & Saft, 2001). From the perspective of affective attachment theory, separation from the mother is an indicator of the quality of the affective attachment that the child and mother have developed. Research shows that children who have developed a secure emotional bond with their mother adapt much more easily to an unfamiliar and new environment.

Sports experts play an important role in the adaptation phase of a child with developmental disabilities and it is necessary to adequately cooperate with parents so that the child fits well into the new environment. It is necessary to respect the individual development of a child with developmental disabilities in order to meet all the basic needs of his learning and adaptation. This includes opportunities for the child's learning development in the area of physical, sensory, sensorimotor and psychomotor development, language, intellectual, emotional and social development. With adequate and special pedagogical work, it is necessary to create the conditions for the development of the remaining, preserved abilities of the child, with proper correction and perhaps elimination of some disabilities and disorders in the individual development of each child.

According to Stefanović-Stanojević (2005), it is stated that certainly affective children when starting kindergarten are usually saddened by separation, but ready to receive and accept the comfort of an unknown person (nurse); they gradually join the game; the reunion with the mother is full of positive exchanges, they greet her, hug her; the foreign teacher can comfort them, but it is clear that they prefer their mother. In this context, similar situations can be recognized in sports teams.

The child's characteristics, that is, his behavior can therefore increase stress in parents and vice versa - increasing stress in parents can affect the child's behavior, that is, the quality of the parent-child relationship (Coplan et al., 2003). A high level of parental stress leads to suboptimal mother-child interaction, poor responses to the child's needs, and an insecure affective bond between mother and child (Crnic, Greenberg & Slough, 1986, according to Damjanović et al., 2014). The process of adaptation will be associated with factors that could be grouped into factors related to the characteristics of the child and factors related to the characteristics of the parents, i.e. the family, the characteristics of the institution, the quality of parent-child and educator-child relationships (Cjetičanin and Subotin, 2010).

Conclusion

Affective attachment theory is a theory about the origin and nature of human sensitivity. When adapting children with developmental disabilities to a sports team, it is necessary for sports experts to fully utilize and cooperate with parents in order to create a safe base for the child, his sense of belonging and the best possible conditions for adaptation to the new environment. It is important to listen to both the child and the parent, follow the signals, which will strengthen the emotional connection and ease the period of separation from the family. In this sense, affective attachment plays an important role.

Children with the characteristic of secure affective attachment have better communication possibilities, show more attention, are more cooperative, which is especially important when fitting in, i.e. adapting to a new environment such as a sports team.

Applying the theory of affective attachment enables an integrated approach in adaptation, not only of a child with developmental disabilities, but also of the whole family, which enables further development of the child's social and emotional capacities.

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PERSONAL BRANDING OF ATHLETES IN DIGITAL MARKETING: THE ROLE OF COMMUNICATION STRATEGIES AND THEIR COMMERCIAL POTENTIAL

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Abstract: In the modern sports environment, personal branding of athletes has become a key factor in creating market value and recognition, especially through digital communication channels. This paper explores how athletes utilize digital marketing and communication strategies to build their personal brand, strengthen audience relationships, and enhance their commercial appeal. By analyzing practical examples and theoretical models, the study examines the impact of social media, content marketing, and authentic communication strategies on the development of personal brands. Special attention is given to the commercial potential of such branding, including sponsorship collaborations, product creation under the athlete's own name, and direct monetization of online presence. The conclusion highlights the growing importance of strategically managing athletes' digital identities and the need for education in this field.

Keywords: personal brand, athletes, digital marketing, communication strategies, commercial potential

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Introduction

In today's digital era, athletes are no longer just competitors on the field; they have become recognizable brands whose identity is shaped beyond the sports arena - especially through digital media. Personal branding of athletes involves the strategic and consistent use of communication strategies to create a unique public image that attracts audiences, sponsors, and the media. Thanks to social networks, athletes now have a direct communication channel with their fans, allowing them to actively shape their identity and control public perception.

One of the most prominent examples of successful personal branding in sports is Swiss tennis player Roger Federer, who built a globally recognizable brand through a combination of athletic success, personal integrity, and carefully managed marketing activities. After ending his collaboration with Nike, Federer signed a lucrative deal with the Japanese brand Uniqlo in 2018, worth around \$300 million - an outcome of his decades-long development of a personal brand based on elegance, consistency, and universal values (Badenhausen, 2018). His ability to maintain brand strength even after leaving the peak of professional tennis demonstrates the power of a long-term identity, one that has become attractive even outside the world of sports. Such examples illustrate the growing importance of strategic digital communication among athletes (Dašić, 2023). When developed consistently and authentically, a personal brand can generate high commercial value and secure long-term visibility and income for an athlete - even after the end of their sports career (Dašić & Jeličić, 2016).

The role of digital marketing in the personal branding of athletes has been strongly supported by research that points to a direct correlation between digital presence and commercial success. Through the analysis of social media profiles, authentic communication, and fan engagement, athletes are able to strengthen their market position. Parmentier and Fischer (2012) analyzed how professional athletes build personal brands through digital communication channels, including social networks and fan interaction. The study highlights authenticity, consistency, and active communication as key factors in developing a successful personal brand. Specifically, it examines the case of professional track and field athletes, showing how individual efforts in self-promotion affect sponsorship deals and public reputation. Digital marketing represents a form of promotion that uses digital channels and technologies to communicate with a target audience (Radaković et al., 2023). It encompasses a broad range of tools such as social media, search engines, email campaigns, mobile apps, and websites to deliver a message, product, or service as efficiently as possible. Its greatest advantages lie in precise targeting, real-time performance tracking, and direct user interaction. In modern business, digital marketing has become essen-

tial for brand building, increasing visibility, and achieving competitive advantage (Dašić et al., 2023; Vlajković et al., 2023; Jeličić, 2024).

Literature review

Today, athletes build their public image not solely based on sporting achievements, but through carefully shaped personal branding, which encompasses their on-field performance, off-field behavior, presence on social media, and relationships with fans and the media. The branding process involves deliberate communication of one's values, lifestyle, beliefs, and attitudes, positioning the athlete not only as a competitor but also as a public figure and potential brand ambassador.

Dašić et al. (2021) analyze the influence of social media on athletes' personal branding and its commercial outcomes. Their study shows how athletes' activities on platforms such as Facebook, Instagram, and Twitter contribute to building their public image and commercial value. They conclude that social media has a growing impact on how the public perceives athletes, as these platforms allow them to share both positive aspects of their careers and glimpses into their private lives. Effective social media management has become crucial - especially post-retirement - with those athletes who employ digital communication professionals enjoying continued income streams beyond their active sports careers (Geurin & Burch, 2017).

The personal brand of an athlete emerges from the interaction of sports performance, personal characteristics, and media representation, significantly influencing the longevity and versatility of their professional careers (Parmentier & Fischer, 2012). Female athletes, in particular, use Instagram as a powerful promotional tool, shaping how the public perceives them. Through direct interaction with followers, they actively construct and control narratives around their professional and personal identities (Geurin-Eagleman & Burch, 2016). Authentic content fosters trust; by sharing real-life moments - achievements, challenges, workouts, or everyday life - athletes cultivate a sense of closeness and parasocial interaction with their audience (Lebel & Danylchuk, 2014).

Professional athletes increasingly use Twitter for real-time communication with fans, sharing opinions, updates, and reactions, which enhances visibility and audience connection. However, given its public nature and message speed, Twitter requires careful content management. Every post can significantly affect public and media perception, demanding a balance between spontaneity and strategic messaging to preserve the brand's integrity and avoid misinterpretations (Pegoraro, 2010). During

major events like the Super Bowl, athletes can leverage Twitter to highlight social or health issues - such as concussion awareness - though research shows this potential remains underutilized (Hull & Schmittl, 2015).

Hambrick et al. (2010) categorize athletes' social media posts into three types: fan interaction, promotion, and personal thoughts. Interactions often include replies and gratitude to fans; promotional posts involve brand partnerships and event announcements, while personal thoughts reveal emotions and everyday life. A strategic balance between these categories enhances authenticity and strengthens personal branding.

Finally, social media - particularly Twitter - has become an essential tool for retired athletes to maintain visibility and influence. Through posts, comments, and fan interactions, they stay engaged with the public and continue to shape their community impact (Dašić et al., 2023). Yet, presence alone is not enough; sustained audience engagement requires a clear, consistent communication strategy rooted in authenticity, relevant content, and active interaction (Clavio & Kian, 2010).

The Role of Communication Strategies

In modern digital marketing, communication strategies represent a key element in the personal branding process of athletes. The way an athlete communicates with the public, the media, and sponsors shapes their public image and directly influences the perception of their identity, values, and credibility (Zubić et al., 2024; Dašić et al., 2024). In this context, social media - particularly Instagram and Twitter - has enabled athletes to take control of their own narratives and independently shape their brands. Through the use of personalized messages, visual consistency, and carefully structured content, athletes convey their stories directly to target audiences, bypassing traditional intermediaries (Parmentier & Fischer, 2012).

Authenticity has proven to be a crucial component of a successful communication strategy. When athletes share sincere stories, personal values, and emotions, audiences develop a deeper emotional connection with them, which increases loyalty and follower engagement (Tošić, 2023; Franjić, 2024). Geurin and Burch (2017) emphasize that authentic communication enhances public identification with the athlete, thereby strengthening their commercial potential. This is especially important in an era when audiences can easily detect artificial content and respond more positively to transparent and direct messaging (Vlajković, 2023).

In addition to authenticity, follower interaction is a vital element of communication strategies. Actively replying to comments, involving fans in content creation, and using social media as a platform for dialogue significantly boost engagement and the visibility of an athlete's brand (Geurin-Eagleman & Burch, 2016). This interaction also influences advertiser interest, as brands increasingly seek ambassadors who not only have large followings but also maintain genuine connections with their audiences.

Dašić et al. (2021) highlight that strategic communication management becomes especially important after the end of an athlete's professional career, as a well-established personal brand allows for continued commercial activity and public presence. Their study shows that athletes who work with communication professionals and set clear goals for their online presence achieve far better results in monetizing their digital platforms.

Therefore, successful personal branding in digital environments requires well-designed communication strategies that combine authenticity, consistency, and active dialogue with the audience. This approach not only builds a strong personal identity but also opens the door to long-term commercial opportunities both within and beyond sports (Penezić, 2021; Penezić et al., 2023; Penezić, Bajić, 2024).

In addition to these aspects, recent research emphasizes the growing role of data analytics (Dašić, G., 2023; Mihić, 2024) in shaping effective communication strategies for athletes. By using tools to track engagement, follower demographics, and content performance, athletes and their teams can optimize their messaging for maximum impact on the target audience. Insights from audience behavior analysis support data-driven decisions regarding content frequency, format, and publishing time, enhancing branding efficiency. In this way, an athlete's digital presence no longer relies solely on intuition or personal judgment but on measurable indicators that offer a competitive edge in the increasingly demanding sports and media landscape (Mihić et al., 2023; Cvejić et al., 2024).

In the modern sports setting, effective tactical communication significantly impacts team performance and player engagement. Lin et al. (2025) introduce *SportsBuddy*, an AI-powered tool for creating sports video stories that integrates automatic player tracking, interactive elements, and time-based visualizations, enabling users – coaches, athletes, and content creators - to easily produce context-rich video highlights. Feedback from over 150 users points to high accessibility and usability, while case studies with university teams reveal a notable influence on training intensity, game analysis, and audience interaction. This tool demonstrates how contemporary communication strategies can enhance knowledge sharing and engagement in the sports sector (Lin et al., 2025).

Economic Aspects of Personal Branding

In the digital era, personal branding of athletes is not only a tool for building reputation but also a vital economic asset. Athletes who successfully develop their personal brands can generate significant income through sponsorships, paid posts, brand collaborations, and the development of their own products or services. Su et al. (2020) emphasize that the number of followers on social media and the quality of audience engagement directly influence an athlete's commercial value in the eyes of advertisers and sponsors.

Unlike the traditional revenue model, which relies solely on sports contracts and prize money, modern athletes diversify their income streams through digital channels (Kostadinović & Ilievska Kostadinović, 2022; Dašić, 2023b). For example, athletes with strong personal brands can earn money even outside of competitions by monetizing video content, participating in promotional campaigns, and selling their own products (University of Delaware, 2024). This practice is especially prevalent among Olympic and individual sport athletes, where marketing revenues often exceed competition earnings.

Recent studies show that personal branding has a direct and measurable economic impact on professional development. Szántó, Papp-Váry, and Radácsi (2025), through a mixed-method study, identified three dimensions of personal brand equity (PBES): attractiveness, differentiation, and recognizability - all of which significantly correlate with salary growth, job satisfaction, and career advancement. These dimensions were confirmed through factor analysis, reliably demonstrating that high PBES contributes to improved financial and professional outcomes. The authors developed a validated PBES measurement scale, enabling individuals to systematically optimize their personal brands for career development. Their work highlights that investing in personal branding is a strategic move with tangible economic value.

Beyond direct financial gain, a strong personal brand provides athletes with long-term economic stability. After retiring from professional competition, athletes who have strategically developed their digital identities are more likely to remain relevant in the market - as influencers, coaches, analysts, or entrepreneurs (Numinal Agency, n.d.). In this sense, branding can be seen as an investment in the future.

Social media plays a crucial role in this process by allowing athletes direct access to both their audiences and markets. Greenfly (n.d.) highlights that engaging content that encourages interaction and sharing has significantly more commercial value than purely informational posts. High-quality communication, visual consistency,

and clearly defined values have become key elements recognized by advertisers as indicators of profitable collaboration.

Thus, the economic aspects of athletes' personal branding go beyond public presence - they involve systematic image management, strategic market engagement, and a long-term approach that integrates sports careers with business potential. In today's sports landscape, personal branding has become a key factor in creating additional revenue streams, particularly through the direct monetization of social media presence. Studies show that athletes with strong digital identities and engaged audiences can secure significant income through sponsorships, promotions, and the sale of personal merchandise. For instance, Yin (2025) emphasizes that social media has become a central tool in enhancing athletes' commercial value by facilitating direct communication with fans and potential sponsors. This strategy is not reserved for elite professionals - even athletes with smaller followings can generate revenue if they build an authentic and engaging brand.

The study by Park et al. (2020) illustrates that student-athletes who actively use social media for personal branding can attract sponsors and generate income, particularly under the newly established Name, Image, and Likeness (NIL) regulations. Therefore, strategic management of digital presence allows athletes not only to increase current revenue but also to lay the foundation for long-term financial stability after their competitive careers.

Personal branding is no longer a secondary aspect of an athlete's career - it is its strategic foundation. Athletes who understand the power of digital communication and the economic value of personal branding gain a clear advantage in both the contemporary sports and business ecosystems. As Arai, Ko, and Kaplanidou (2013) point out, a strong personal brand not only enhances athlete identity but also affects their perceived professional value among sponsors and the general public. Furthermore, Hambrick and Mahoney (2011) stress that effective use of social media gives athletes direct control over their narratives and opens the path to a sustainable post-sport career.

Conclusion

In digital marketing, personal branding has become an indispensable element of the modern sports industry. Through carefully crafted communication strategies and active social media presence, athletes can develop a strong and authentic public identity. Authenticity, visual consistency, and engagement with the audience not

only foster greater trust and fan loyalty but also directly impact the athlete's commercial potential.

Modern approaches to personal branding in sports confirm that digital communication has become a key tool in building recognition and market value. Effective use of technology and strategic management of digital identity enable athletes to achieve greater audience engagement and generate additional income streams. A personal brand is no longer merely an addition to an athlete's career, but its sustainable and long-term foundation.

Numerous studies confirm the economic value of a personal brand, showing that athletes with strong digital presence generate substantial income beyond competition - through sponsorships, partnerships, and personal projects. This income model ensures financial security both during and after an athletic career. Digital platforms have enabled athletes to communicate directly with audiences and markets, making them not just competitors, but content creators, entrepreneurs, and opinion leaders.

Ultimately, personal branding is no longer a supplement to an athlete's career—it is its strategic core. Those who understand the power of digital communication and the economic potential of a personal brand hold a distinct advantage in the modern sports and business ecosystems.

Conflict of interests:

The authors declare no conflict of interest.

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MEDIA REPRESENTATION OF ESPORTS CULTURE IN SERBIA

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Abstract: Through a mixed-methods approach, this paper aims to research the representation of esports culture in Serbian media, specifically focusing on three news sites: Nova, Republika, and Sport Klub. Esports were insufficiently represented through Serbian media, making up less than 0.1% of all sports-related articles in 2023. Sport Klub had the most esports content, while Republika had the least. Nova and Republika had mostly reported on the Serbian esports scene, while Sport Klub had focused on the international. However, there were more articles about the international esports scene. Popular video games League of Legends and Counter-Strike 2 had received the most media attention (90%), while other esports had an insignificant number of articles (8%). The final 2% were articles that were not related to esports. This research highlights the need for improvement of media reporting on esports, as well as the necessity of a multi-layered journalistic approach towards this growing industry.

Keywords: esports, journalism, electronic media, video games

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Introduction

Electronic sports, or esports for short represent a significant “contemporary socio-technical phenomenon” (Werder, 2022), where the world of video games is not perceived just as an everyday activity with the goal of leisure or pastime, but as a niche that enables the expression of competitive spirit through different means of participation, be it passive (through fandom, cheering or watching competitions), or active (from participating in local tournaments to the possibility of obtaining a professional career). Marelić and Vukušić (2019) emphasize that playing any video game does not imply an esports activity, but that every type of esports activity represents playing video games. They also point out that the definition of esports as “playing video games in a competitive manner” is oversimplified, since each video game has specifics that differentiate it from others (Marelić & Vukušić, 2019). In the next example, the similarities and differences between two very popular esports video games will be discussed, including League of Legends (LOL) and Defense of the Ancients 2 (Dota 2), which belong to the same video game genre, known as a MOBA (multiplayer online battle arena). Even if the games are similar in terms of genre, design, and arena layout, as well as characters that have certain powers and uses in strategy (called champions in LOL, or heroes in Dota 2), they differ in “mechanics”, as stated by Adams (2014), Marelić and Vukušić (2019), that is, a set of rules and elements that these two games possess, as well as the different ways these games present world-building to other players. Stories in video games that lean towards esports accomplishments do not have to be necessarily detailed, as the games are designed on the principle of repetition so that players can hone their skills and knowledge through continuous playing (Marelić & Vukušić, 2019). Esports are in a specific position regarding their conceptual definition, in the context of specific characteristics comparable or similar to existing sports (De-Santis & Morales Morante, 2023). On the one hand, video games with esports elements tend towards individuality and diversity, enabling players to have unique experiences that do not have to be comparable with other sports. Even when it comes to video games of the same genre, if a player masters one game, it does not mean that they will be successful in mastering other games of the same genre. On the other hand, there are video games that are not just similar to popular and physically demanding sports, but are actively trying to simulate that experience through the use of computers and scenes (Adams, 2014), as can be seen with popular video game franchises such as NBA2K, FIFA or eFootball Pro Evolution Soccer (formerly known as just Pro Evolution Soccer or PES).

In contemporary sports environments, competitions are of exceptional importance, both in classic sports and in modern ones. Kuljić and Koković (2011) claim that the

value of sports tournaments can be valued based on the achievements of athletes and the tournament itself, which, in turn, can be translated to modern sports interpretations. Although video games have become quite popular because of the gaming industry, competitions in video games are not a novelty of the 21st century – they have existed for half a century. One of the first esports competitions was organized for the video game *Spacewar!* in 1972, where Stanford University students were invited to participate and possibly win the grand prize – a one-year subscription to *Rolling Stone* magazine (Vega Ramirez & Gonzalez Carrion, 2023). Even if the *Spacewar!* competition was initially used as a science experiment, it soon became the backbone toward a higher goal – to popularize video games. Sega, a recognized and well-respected Japanese company in this industry, sponsored a couple of local video game tournaments in the '70s of the last century to promote their products and strengthen the consumption of video games in the country (Borowy & Jin, 2013). However, the massification of these competitions is a potential that has not yet been noticed. Jin (2021) notes that the turning point for esports was precisely mass viewership, which not only included big competitions but also mass media, as well as other channels and emitters, to better recognize the aforementioned potential. Even if the public influence of these events is usually marginalized, the esports industry does depend on the audience, which helps it further develop (Jin, 2021). Just a couple of years later, that is, in 1978, one of the biggest video game tournaments in the '70s was held, with 10.000 participants, in the then popular and now cult video game *Space Invaders*, created by Tomohiro Nishikado (Vega Ramirez & Gonzalez Carrion, 2023). One of the novelties of the time was the existence of persistent high scores, which was not a factor for previous video games. Achieving great interest in this activity allowed competitions of this type to be established as frequent and normalized events for future generations. Jin (2021) emphasizes that even if the '70s and '80s served as a time where these competitions served as prototypes, the esports that we know now were popularized in South Korea only during the '90s of the last century. The South Korean government recognized the economic and cultural impact and importance of esports, which is why they formed the Korean eSports Association in the year 2000 to promote and regulate these events in the future (Padua, 2021). In the 21st century, after the recognition of esports' potential, these competitions have become globalized, with a prize pool of well over 40 million dollars, as was seen on *Dota 2*'s tournament *The International* in 2021 (Michael, 2021). On the other hand, viewership is only rising, which can be proven by the data from *LOL*'s tournament *Worlds Championship* in 2019, which had over 44 million concurrent viewers, while also having a record-breaking 100 million viewers on the final match for that same year (Webb, 2019).

De-Santis and Morante (2023) explain the significance of the audience in the context of esports, emphasizing that it has transformed the perception and consumption of different products, while at the same time, encouraging the desire to participate in said tournaments. Brown, Billings, Murphy, and Puesan (2018) point out that esports fans show a greater commitment and desire to interact with esports content than fans in other sports domains, and that they, as consumers of content, become one of the key actors in the growing esports industry. One of the main characteristics of sports, that is, the desire to win and achieve high levels of play simultaneously, motivates the e-athletes and the audience (De-Santis & Morales Morante, 2023). In the context of media consumption, where esports are usually presented through live streaming services, interactivity is shown as a key factor in achieving the loyalty of the audience towards a certain media, keeping them motivated to further consume content (Huang, Kim, & Ko, 2013). Even if Ward and Harmon (2019) claim that esports could have evolved without live streaming platforms such as Twitch, they still state that these services have contributed to the faster development and popularization of this industry, having introduced numerous technological innovations to further shape the modern communication sphere itself.

Perreault and Perreault (2021) emphasize that even if playing video games is not of interest to traditional media and journalists, media content about the esports industry is usually centered around business news. As esports become a bigger market, the media is expected to broaden the journalistic approach, not only focusing on the business aspects but also on social and cultural implications, as well as the impact of esports on technological development and entertainment (Perreault & Perreault, 2021). Liu, Shang, and Zheng (2021) confirm these claims by stating that new media are not adequately used to promote esports. For the audience to be informed sufficiently about the modern aspects of esports, be it readers or viewers, the presentation of esports needs to be comprehensive and multi-faceted.

Is the esports scene recognized in Serbia? In Serbia, the esports scene is still in its early phase of development, so it can be said that it is currently underutilized and underestimated by domestic media. However, as Ratković and Pečić (2024) state, there are numerous promotional potentials in Serbia for esports, whether it is branding, advertising, or sponsorships, as well as partnering with influential people, or influencers, who transfer the traditional markets to the Internet, bringing more visibility to esports. The potential of esports has been recognized by famous Serbian traditional sports clubs, such as Red Star Belgrade (sr. Crvena Zvezda) (n.d.) and Partizan (n.d.), who have formed individual esports teams for numerous popular esports titles, such as League of Legends and Counter-Strike, or other, less popular esports games, such as FIFA and PES. However, for esports to be recognized and covered,

having a cluster of esports teams that embody two popular clubs is not enough, while also requiring enough content to achieve adequate media visibility. In Serbia, there are no official news sites that exclusively cover esports, but there are other sites that provide information about esports, such as tournaments, marketing, or other events, such as Fortuna Esports (n.d.) or Klan RUR (n.d.). In terms of sections, Sport Klub, as a specialized sports media, is the only Serbian media site that has a dedicated “Esports” section (Sport Klub, n.d.), while other news sites categorize news and information about esports in separate sections labeled as “other”. However, how often does Serbian media report on esports events and information? This research article has a goal to review the issues regarding media reporting about esports, be it Serbian or international events, and to better indicate to media broadcasters the importance of this niche in Serbia, which does not need to be related solely to business news but also to informative and educational content.

Methods

The paper aims to analyze Serbian news sites Nova (semi-tabloid), Republika (tabloid), and Sport Klub (specialized sports media) to determine the representation of esports content in Serbia. This empirical research employs a mixed-methods approach to content analysis, including quantitative and qualitative analysis, “in order to gain complete knowledge about the subject of research” (Bešić, 2019). Quantitative analysis is aimed at studying the content of the message, while qualitative analysis involves drawing conclusions about the assumed goals, the foundation of which lies not only in the content of the message but also in the social context in which communication takes place (Manić, 2017). The research period equally includes all news sites for the length of one year, starting from January 1st, 2023, to January 1st, 2024. By applying this content analysis, the research aims to achieve the following goals:

1. To determine the amount of e-sport content uploaded on news sites Nova, Republika, and Sport Klub in 2023.
2. To determine the representation of esports content in the context of domestic and international esports scenes on news sites Nova, Republika, and Sport Klub.
3. To determine which video games were the most represented in esports content uploaded on news sites Nova, Republika, and Sport Klub.
4. To determine the differences in how journalists approach reporting on esports content on news sites Nova, Republika, and Sport Klub.

Based on the aforementioned research goals, the following research question was formed: In what way is esports content presented on news sites in Serbia? Based on the research question and goals, the following hypotheses were formulated:

H₁: News sites Nova, Republika, and Sport Klub follow esports content less than general sports content.

As Koković (2004) has claimed, sports niches tend to have lesser representation than the already established popular sports in the media scene, which is why it is important to confirm the quantity of media attention given to esports events and personalities on news sites in Serbia. To test H₁, Serbian news sites were searched as follows. To research esports content on news sites Nova and Republika, specific keywords were employed on their respective search systems. The main keyword was e-sport, with varieties of the term in English (esports) and Serbian (esport, elektronski sportovi). The keyword e-football (sr. e-fudbal), written in Serbian, was used on the site Republika, as it was used as a tag on certain media articles. On the other hand, the news site Sport Klub had its own Esports section, so the qualitative analysis was achieved by manually searching the section Esports, and its respective subsections LOL, Dota 2, CS:GO, and Other sports (sr. Ostali sportovi). To confirm the differences in the quantity of media coverage between esports and other sports, Google's advanced search system was employed, with a time frame that matches the research, to reach the indexed pages that are related to sports content. A specific formula was used for each Serbian news site: Nova (site:https://nova.rs/ "sport"), Republika (site:https://www.republika.rs/ "sport"), and Sport Klub (site:https://sportklub.n1info.rs/ with words "sport", "football", "tennis", "volleyball", "handball", "rugby", and "golf" in Serbian (sr. "fudbal", "košarka", "tenis", "odbojka", "rukomet", "ragbi" "golf") as it is a specialized news site that covers a variety of sports).

H₂: Esports content on Serbian news sites Nova, Republika, and Sport Klub shows a greater representation of the domestic esports scene than the international esports scene.

Even if esports in Serbia are underdeveloped, they show potential (Ratković & Pečić, 2024), which is why there is an expectation that the domestic esports scene would receive more media coverage in Serbia than the international esports scene. This assumption indicates the possibility of an imbalance between reporting about domestic and international content. To test H₂, media articles from Serbian news sites Nova, Republika, and Sport Klub were analyzed through the context of events or subject (team or individual), as their affiliation with the domestic or international esports scene. News articles that did not meet the criteria were marked as "uncategorized". Greater media representation of a specific scene implies that either do-

mestic or international esports cover more than 50% of media content about esports during the research period.

H₃: Video games League of Legends and Counter-Strike 2 are represented by the news sites more than other esports.

The assumption is that specific video games in the esports industry, such as League of Legends, Defense of the Ancients 2, and Counter-Strike 2 (previously known as Counter-Strike: Global Offensive), are represented more in Serbian media than other, less popular esports. These niche esports titles include, but are not limited to: Fortnite, Apex Legends, eFootball Pro Evolution Soccer, NBA2K, Call of Duty: Warzone, Rocket League, Tekken, or Street Fighter, as well as many other games which will be mentioned if they had any media coverage. To test H₃, media content from Serbian news sites Nova, Republika, and Sport Klub was analyzed, as a way to determine which video games have greater representation in esports reporting, implying that either popular or less popular video game titles have more than 50% of media coverage about esports during the research period.

H₄: There are significant differences in terms of approach when reporting about esports between Serbian news sites Nova, Republika, and Sport Klub.

The assumption regarding the disproportionate way media services cover esports news is established by analyzing one semi-tabloid (Nova), one tabloid (Republika), and one specialized sports media (Sport Klub). To test H₄, the differences in reporting about various aspects of esports were analyzed, including tournaments or competitions, player profiles, industry news, or differences in editorial policies (i.e. neutral reporting in contrast to promotional reporting), with additional observation of the narrative used in said media content (language and depth of content).

Results: Quantitative analysis

On the news site Nova, the majority of sports content was categorized in the Nova Sport section, while most esports content was usually in the subsection Sports - Other (sr. Sport - Ostalo), with instances where certain content was in other sports sections, such as Basketball (sr. Košarka), or non-sport sections, such as IT. On Nova, over 26.000 news articles were published about sports in general, while esports content only made up 0.1% (15 articles) in 2023. In conclusion, with this data, Nova published one article about esports every 24 days in 2023. Considering the published esports content on Nova in 2023, the domestic esports scene was represented more (53%) than the international esports scene (40%), while only 7% of content did not

cover a specific esports scene, but another non-esports game (Grand Theft Auto 6). The most represented esports on Nova in 2023 were NBA2K (27%), followed by other games, such as Counter-Strike 2 (21%), Valorant (12%), Grand Turismo 7 (12%), League of Legends (7%), and PES (7%). The final 14% of content did not cover a specific esports game.

On the news site Republika, the majority of sports content was categorized in the Sport section, while most esports content was usually in the subsection Other sports (sr. Ostali sportovi), but there were instances in which certain esports content was categorized as part of the main Sports section. On Republika, over 21.600 news articles were published about sports in general, while esports content only made up 0.1% (10 articles) in 2023. Only 50% of esports articles covered esports fully, while 20% covered other sports, in which esports had a dedicated short paragraph or a single sentence. On the other hand, 30% of esports content did not cover esports at all, but other sports (Republika 1 & S.M. 1, 2023; Republika 2 & S.M. 2, 2023) or sensationalist and sexually suggestive content (Republika 1, 2023), even if these articles were obtained through the initial search results. In conclusion, with this data, Republika published one article about esports every 52 days. Considering the published esports content on Republika in 2023, only the domestic esports scene was covered (70%), the international esports scene was never covered as a topic, and 30% of the content was not about esports at all. The most represented esports on Republika in 2023 were PES (30%), followed by other games, such as NBA2K (20%), League of Legends (10%), and online chess (chess.com) (10%), while 30% of content was not relevant to esports.

As previously mentioned, the news site Sport Klub specializes in sports content, where each sports activity usually has its own dedicated section, including the generalized Esports section, and subsections dedicated to specific esports. On Sport Klub, over 24.000 articles were published about sports in general, while esports content only made up 0.1% (193 articles) in 2023. Additionally, after September 2023, not a single article was written for the Esports sections on Sport Klub. In conclusion, with this data, Sport Klub published one article about esports every 11 days in 2023. Considering the published esports content on Sport Klub in 2023, the international esports scene was represented more (71%) than the domestic esports scene (27%), while 2% of content was not connected to any specific scene, but to video game updates. The most represented esports on Sport Klub in 2023 was League of Legends (51%), closely followed by Counter-Strike 2 (48%), while Rocket League had the least content on this news site (1%). Even if Dota 2 had a dedicated esports subsection, not a single article was published about the video game in 2023.

Results: Qualitative analysis

In the context of media representation about various aspects of esports, on the news site Nova articles usually included announcements (Todorović, 2023) and results (Mijušković, 2023) from tournaments, industry news (Jakovljević, 2023), charity events (Dimitrijević 1, 2023), famous people, including occasional promotional reporting. Regarding promotional reports, an article from Nova's Basketball section (sr. Košarka) initially presented its readers the ways they can bet on esports, but, with further analysis, it was determined that it was a covert PR article, that promoted a Croatian site for online esports betting (Dimitrijević 2, 2023). When articles included tragedies from the esports scene, Nova chose to report on these themes credibly, i.e., on the death of player Karel Ašenbrener, better known as Twisten (Ljubisavljević, 2023). However, some articles included esports with a political context, in which the Serbian e-athlete for eFootball Pro Evolution Soccer, Marko Roksić, refused to participate in a tournament where he would have to play against an e-athlete from Kosovo (Dimitrijević 3, 2023). News site Nova was extremely dedicated to the domestic esports scene, including articles that presented it in the spotlight. The article (Image 1) initially described playing video games as a hobby, in which the author later elaborated on how and why esports have become such a successful industry. In the context of specific esports, Nova listed popular video game titles such, such as League of Legends and Counter-Strike 2, as well as important leagues for Serbian e-athletes, such as EBL (Esports Balkan League) and RES (Relog Electronic Sports), through which domestic teams can qualify for other prestigious European tournaments. The end-of-article statement from the founder of the Serbian NGO esports association, Zero Tenacity, who invited people to attend Games.Con, a Serbian video game and popular culture festival (Nedeljković, 2023), can be interpreted as a form of promotional reporting. However, this article had "two versions" on Nova, i.e., with different authors (Nedeljković, 2023; Marković, 2023) and sections (Sports - Other and IT), while the content (text, headline, and images) stayed the same. Even with Nova being defined as a semi-tabloid

Serbian teams become a superpower in world esports

SPORT - THE REST | Author: Vojislav Nedeljković | 30. Nov 2023 | 15:01



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Photo: Dragan Majan

Video games, as the most popular leisure activities, bring together more than two billion users around the world, and that number is still growing.

What used to be just a hobby, today grew into a serious industry with great potential for growth and success. Professional development of e-sports, e-sport competitions, streaming platforms and virtual reality are just some of the key trends that shape this dynamic industry.

Image 1. Screenshot from source: (Nedeljković, 2023)

news site, there was no sensationalist content, nor were there similar narratives found in the researched articles.

In the context of media representation about various aspects of esports, on Republika, articles usually included industry news (esports teams changes), statements from e-athletes, but there was also content that was disguised as esports content. As was the case on the news site Nova, Republika also had an article with political context, about the same e-athlete who refused to play against another e-athlete from Kosovo (Republika 2, 2023). Esports content on this news site was usually presented through clickbait headlines as a way to garner attention. However, clickbait proved to be a major issue on Republika, as it potentially may mislead readers on the context and/or subject of the articles. In the first example (Image 2), the headline uses terms like “horrific reinforcement” (sr. strašno pojačanje), “Bayern Munich” (sr. minhenski Bajern), and “World Cup” (sr. Svetsko prvenstvo), while including images of the Marakana stadium, which would mislead readers into thinking that the article was about a new soccer player for Red Star Belgrade. However, the article showed that it was e-athlete Mūcahit Sevimli, who previously played for Bayern’s esports team, while his photograph was only shown at the end of the article. The lead of the article contained insufficient details, while the article itself did not show more information about the e-athlete’s career or accomplishments, nor did it show any other useful information about the subject of the article (Republika 3, 2023). In another example, the name of the subject was clearly emphasized in the headline, but it could not have been interpreted whether it was an athlete or an e-athlete of Partizan before reading the article. However, the opening sentences of the article show that it is not an athlete or e-athlete, but rather a Serbian YouTuber, Luka Bojović (Lux27), who became part of the management board of Partizan Esports (M.M., 2023). Even if the article had more content than the previous one, insufficient details were provided about the article’s subject and the subject’s role in the organization, while the statements were taken from social networks. This shows that the news site Republika had focused

HORRIFIC REINFORCEMENT AT THE MARACANA: Former member of Munich Bayern and a in the audience in the Red Star World Cup!

 AUTHOR: REPUBLIC SPORT | 29.10.2023 | 22:51      

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A deal has been reached.



E-sport, and therefore E-football, are increasingly popular both in Europe and in Serbia.

The teams are doing everything in order to have the best possible compositions, and in that goal the Red Star team has brought a lot of reinforcements.

It is Mikahit Sevimli, who arrives in the Serbian capital from the ranks of Munich Bayern and will certainly represent a huge reinforcement for the red and whites.

Image 2. Screenshot from source:
(Republika 3, 2023)

solely on attention-seeking content, not educational or analytical articles, when reporting on esports.

The news site Sport Klub had only one journalist (Vladimir Belopavlović), who was covering the many aspects of esports, including announcements of popular tournaments (Belopavlović 1, 2023; Belopavlović 2, 2023) and industry news (Belopavlović 3, 2023). Additionally, the news site provided detailed reports from domestic competitions such as EBL (Belopavlović 4, 2023), and international tournaments like LEC for League of Legends (Belopavlović 5, 2023). Unlike other media broadcasters, Sport Klub had occasional segments on rumors from the industry or the scene itself (Belopavlović 6, 2023; Belopavlović 7, 2023). In one example, an article reported on a rumor from HLTV (a site dedicated to competitive Counter-Strike content) about the potential return of e-athlete Nemanja Isaković (nexa) to the permanent lineup of OG, a European esports team. Also, the article talked about potential changes within the OG team itself, which included the sale of players Abdul Gasanov (Degster) and Adam Zouhar (NEOFRAG) (Belopavlović 6, 2023). In another example, an article reported on a rumor from esports journalist Briec Seeger, in which he talked about the Croatian e-athlete Josip Čančar (Jopa) from Partizan's esports team, potentially becoming part of Finet-work KOI, specifically the esports academy of the Spanish team KOI. Additionally, the article listed Čančar's achievements in the last season, while also acknowledging his contributions to Partizan's campaign to become the EBL champions (Belopavlović 7, 2023). These articles show that rumors could be approached professionally, as the headlines themselves emphasized that they were rumors, while the sources of information were listed in the lead of the articles themselves.

The interview was also a very interesting journalistic format that Sport Klub used when reporting on esports. Even if the news site had only published one interview with an e-athlete in 2023 (Belopavlović 8, 2023), it showed the potential of Serbian e-athletes in regional and European tournaments, as well as success in international esports teams. In the interview (Image 3), Mladen Mitić (Cl0x), a veteran of the League of Legends esports scene, talked about his longstanding career, the transition from the Irish esports team Nativz to the Serbian

SK interview – Cl0x: Partizan has long been interested in us

LOL | Author: Vladimir Belopavlović | 16 Jan 2023 19:20 | 6 comments

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The black and whites enter the new season of the Esports Balkan League with a team that dominated the second English league for the past year. It is led by EBL veteran Mladen "Cl0x" Mitić, who spoke to us before the start of the group stage of the spring championship.

Image 3. Screenshot from source:
(Belopavlović 8, 2023)

team Partizan, as well as expectations for that season. He stressed the importance of having a good team while also being critical when talking about the performances of other teams in the EU Masters tournament, emphasizing their lack of strategy and structure of play (Belopavlović 8, 2023). These segments deserve more media attention, as they show us the more personal sides of e-athletes, as well as emphasizing their skills, potential, and allowing them to share their opinions on esports in general. Even if Sport Klub was mostly professional when reporting on esports, there had been instances when clickbait was used in headlines. In the example of e-athlete Andrea Radovanović (Radosin), where the headline presented him as a Serb who became the Rocket League champion for that year, while the rest of the article showed that he was not a Serb, but rather a “French player of Serbian origin”, who has won his title while playing for Team Vitality, a foreign esports team (Belopavlović 9, 2023).

Discussion

Based on the concept of media representation of esports, the results of the Serbian news sites Nova, Republika, and Sport Klub showed specific differences in the quantity of content, the representation of the domestic and international scenes, the popularity of certain video games, and the approach in reporting on esports. Esports had been presented through the media as extrinsic content, usually categorized in minor or irrelevant sports sections, while the quantity of the content was modest, and the quality depended on the approach of specific media. Even if 214 esports articles were found in the research period, this industry was insufficiently represented through news sites, unlike other sports, as esports only made up less than 0.1% of all published sports content on Serbian news sites Nova, Republika, and Sport Klub in 2023, thus confirming H1. Additionally, the Google search results on sports as a whole showed us only indexed pages (articles), or rather sites that the Google crawler had analyzed and stored in Google’s index, thus being available through the actual search engine (Google, n.d.). This means that there were certain articles that were not indexed in Google, but existed on the news sites, meaning that there was potentially an even larger disproportion between sports and esports content on these news sites.

In the context of disproportion of reporting on different esports scenes, Serbian news sites Nova and Republika were more focused on the domestic esports scene, while Sport Klub was more focused on the international esports scene. Additionally, esports content on Republika was only focused on the domestic scene, deciding not to report on the international scene. However, if the quantity of all Serbian news

sites was accounted for, the domestic esports scene (28%) was represented less than the international esports scene (69%), which did not confirm H2. Only 3% of media content was neither about the domestic nor the international esports scene.

In the context of the representation of specific esports, video games League of Legends (46%) and Counter-Strike 2 (44%) received more media attention than other video games. These popular video game titles consisted of 90% of all esports content on Serbian news sites in 2023, thus confirming H3. However, even if popular esports titles were the most represented, the video game Defense of the Ancients 2 (Dota 2), with an average of 430.000 players in 2023 (Steam Charts, n.d.), and a dedicated section on Sport Klub, had not been the subject of any media article about esports in that year. Other, less popular esports were present in 8% of esports content, while the final 2% consisted of articles that were not about esports at all. However, it was noticed that news sites Nova and Republika reported more on esports that simulated physically demanding sports, such as NBA2K (basketball simulator) and eFootball Pro Evolution Soccer (soccer simulator), while Sport Klub was more focused on the aforementioned popular titles, League of Legends and Counter-Strike 2.

In the context of the differences in how journalists approached reporting, each news site showed significant differences in the way they tackled esports content, thus confirming H4. Journalists of the semi-tabloid news site Nova presented relevant esports content, including news, tournaments, and other quality articles, while approaching serious topics professionally. Journalists from the tabloid Republika reported the least on esports, while approaching the topic in the form of flash news, with more images than text, clickbait headlines, and a sensationalist narrative. Journalists of the specialized sports news site Sport Klub approached esports in more detail than others, publishing the majority of esports articles in 2023, including news, reports, interviews, and rumors (that were adequately presented and marked).

Conclusion

The analysis of media representation of esports culture in Serbia revealed significant challenges that could stifle the development of this industry in the country. Key issues included the marginalization of esports as a secondary topic within the news media's framework, thereby limiting the quantity of content and its visibility. Despite the global growth of esports, and evident interest by Serbian news media, the underutilization of the momentum that esports had, has in turn, influenced the quantity of content about this topic. Referring to H1, or rather the fact that esports content had less than 0.1% of sports-related articles in Serbia, proves that news

media might not highlight this topic, because of the lack of public interest. For example, Sport Klub had a dedicated esports section and the most esports content in 2023, yet had stopped reporting about this topic by 2024. Another important factor is the disproportion of the domestic and international esports scene. Referring to H2, this lack of representation was not equal across all news media, but had highlighted a lack of interest toward the domestic scene, which had less than a third of content published in 2023. Although it is clear that the international scene has many years of history and tradition, the domestic scene required additional support in order to achieve a breakthrough across news media. This did not necessarily mean that the news media had to focus solely on the domestic scene, but the fact that they should not discriminate one or the other. However, the scenes were not the only parts of esports being disproportionately represented. It was clear that some esports titles had suffered this exact problem. By highlighting H3, the problem of media favoritism was apparent, as popular video game titles were garnering more attention than the niche titles of esports. Even if the popular esports titles were starved of media attention in some cases (the reporting of Nova and Republika), the totality of esports content was severely focusing on popular and marketable video games. In order to be informed about the niche esports events and news, the audience must desperately search other sections of media sites, with in expectation to gain information about this topic. This can prove to be a problem, as domestic media sources do not inform about esports in a timely manner. In order for esports to be a more attractive topic, the news media must find a way to keep public interest by improving the quality of reporting in Serbia, not focusing solely on quantity. By highlighting H4, even if there were differences in reporting styles, a problem arises when a style becomes ethically questionable. As seen in the reporting style of Republika, its sensationalist approach had proved to be a problem, as the use of clickbait could disinform the audience, and with its discovery, establish distrust in news media and the reports of this topic. However, certain news media had discovered that by applying diverse types of journalistic forms could keep public interest in esports, as seen with Sport Klub journalists using interviews and rumors in an ethical manner. Journalists must restructure their approach in order to better understand the dynamics of this scene to attract an audience interested in this form of entertainment. The results indicate a need to improve the quantity and quality of media content about esports (domestic and foreign), as well as the need for specialization of media and journalists, to ensure diversity in reporting on this growing industry.

Conflict of interests:

The authors declare no conflict of interest.

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**ŠABLON: NASLOV RADA (CENTRIRAN, CALIBRI SIZE 12, BOLD, SVA SLOVA
VELIKA, MAKSIMALNO DVA REDA)³³**

Ivana Marković³⁴, Petar Petrović³⁵, Mirko Mirković³⁶

Summary

Poželjno je da rezime sadrži do 150 reči, te da sadrži sve bitne činjenice rada, poput cilja rada, korišćene metode, najvažnijih rezultata i osnovnih zaključaka autora.

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Izbegavajte korišćenje indeksa i specijalnih simbola u apstraktu, odnosno definišite sve skraćenice u apstraktu kada se prvi put upotrebe. Nemojte citirati reference u apstraktu.

Key words: *navesti, maksimalno, pet, ključnih, reči.*

JEL: Q16, M24 (www.aeaweb.org/jel/jel_class_system.php)

Introduction

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³³ Rad je deo istraživanja u okviru projekta br. IV 26003 - Uticaj pandemije Kovid 19 na industriju oglašavanja i sponzorstva u sportu. Vreme trajanja projekta: 2019-2012. *Ovaj segment nije obližatoran u radu.*

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Molimo Vas da poštujuete osnovna načela strukturiranja naučnih radova, odnosno trudite se koliko je to moguće da Vaš rad ima sledeće segmente: Uvod, Cilja rada i korišćena metodologija, Rezultati rada sa diskusijom, Zaključak, Literatura.

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Radi unosa **jednačina i formula** u rad, koristite Microsoft Equation Editor ili dodatak za pisanje jednačina MathType (www.mathtype.com). Ne preporučuje se korišćenje ugrađenog editor jednačina iz programa Word 2007. Proverite da li ste definisali sve simbole u jednačini (neposredno posle jednačine).

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Tabele moraju biti formirane u tekstu rada, a ne preuzete u formi slika iz drugih materijala. Tabele unositi u sam tekst rada i numerisati ih prema redosledu njihovog pojavljivanja. Nazivi tabela moraju biti dati neposredno iznad tabele na koju se odnose. Koristite dole prikazani stil tokom njihovog formatiranja. Naslov tabela pisati sa razmakom 6 pt – iznad/before i 3pt – ispod/after, u fontu Calibri, font size 11, ravnanje Justified. Tekst unutar tabela pisati fontom Calibri, font size 9. Tekst u zaglavlju tabela boldirati. Izvor i potencijalne napomene pisati sa razmakom 3 pt ispod tabela (before). Izvore i napomene pisati u fontu Calibri, font size 10, ravnanje Justified. Naredni pasus početi na razmaku od 6pt od izvora tabele ili napomene (after). Tokom pisanja rada u originalnom tekstu treba markirati poziv na određenu tabelu (Table 5.). Trudite se da se sve tabele u radu veličinom uklapaju u zadati format strane (Table properties – preferred width – max 97% - alignment: center). Sav tekst u poljima tabele treba unositi u formi (paragraph – spacing: before/after 0pt, line spacing: single). U slučaju da se tabela lomi na narednu stranicu, molimo Vas da prelomljeni deo tabele na narednoj stranici bude praćen zaglavljem tabele.

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)

Grafike, dendrograme, dijagrame, šeme i slike treba unositi u sam tekst rada (ne koristiti opciju Float over text) i numerisati ih prema redosledu njihovog pojavljivanja. Njihovi nazivi se moraju pozicionirati neposredno iznad grafika, dendrograma, dijagrama, šeme ili slike na koju se odnose. Kod navođenja naslova, izvora i napomena koristiti isti stil koji je predhodno prikazan za formiranje tabela. Tokom pisanja rada u originalnom tekstu treba markirati pozive na određeni grafik, dendrogram, dijagram, šemu ili sliku (*Graph 2.*). Svi grafici, dendrogrami, dijagrami, šeme i slike u radu se svojom veličinom moraju uklapati u zadati format strane, te moraju biti centralno postavljeni. Fotografije nisu poželjne u predmetnom radu, a ukoliko se one ne mogu izbexi molimo Vas da koristite optimalnu rezoluciju (preniska rezolucija dovodi do pikselacije i krzavih ivica, dok previsoka samo povećava veličinu fajla bez doprinosa čitljivosti rada).

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