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QUANTITATIVE ASSESSMENT OF AI DETERMINANTS IN CYBER-SOCIAL SYSTEMS FOR SPORTS ECONOMY AND HEALTHY LIFESTYLE PROMOTION

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Original research

A B S T R A C T

This research focuses on clarifying and specifying the impact of artificial intelligence (AI) on the development of sports and promoting a healthy lifestyle. Moreover, the research formulates recommendations to optimize this impact in Russia. To achieve this, the authors synthesize the experiences of the top 20 "greatest sporting nations" in 2024–2025, which serve as the foundation for a proposed model of a cyber-social system within the sports economy, along with an original classification of AI dissemination determinants based on their contribution to the advancement of physical culture. The key finding highlights that the influence of AI on the popularity of sports and healthy living varies depending on the determinant. The most significant are social, regulatory, and budgetary factors. Research and technological determinants play a supplementary role. Infrastructure and venture-related determinants are deemed less influential. The research presents and compares alternative scenarios for developing Russia's sports economy up to 2030, depending on the extent of AI integration. It also outlines strategic targets for AI development to enhance its positive influence on the sports economy under an optimistic scenario through 2030. The authors drafted a roadmap for AI development to guide its effective integration into the sports economy, aligned with this optimistic scenario. The authors' proposals and applied research contribute to implementing the Strategy for the Development of Physical Culture and Sports in the Russian Federation up to 2030, incorporating AI regulation measures into its framework.

1. INTRODUCTION

Widespread public engagement in sports and healthy lifestyles is universally recognized as a key attribute of social well-being and a national priority. Sports and healthy lifestyle are encompassed by the broader concept of "physical culture," which reflects the idea that the inclination toward and involvement in sports and healthy living are deeply rooted in a society's cultural fabric (Gallup & Eldakar, 2025; Tang et al., 2025). With the growing influence of AI, the structure of society is undergoing a profound transformation. The culture of

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contemporary communities is evolving. Today's technocratic society shares a digital culture, at the heart of which lies AI.

On the one hand, adopting smart AI-powered technologies has significantly expanded the potential for developing sports and promoting healthy lifestyles. Particularly, digital marketing has revolutionized the way sports and healthy lifestyles are popularized. AI-driven websites spark user interest in sports and wellness topics – after a single interaction with related content or advertisements, users are presented with a stream of similar information. When this process is not perceived as spam, it effectively introduces users to the latest trends in sports and healthy lifestyles and enhances their motivation to engage in physical activity (Jung et al., 2025).

AI-powered smart advice is invaluable to seasoned athletes – helping them master the finer points of proper nutrition and exercise – and equally useful to newcomers, easing them into sport and a healthy lifestyle with minimal initial knowledge while steering them clear of discouraging mistakes. Online fitness courses, sports coaching, and mentorship have made sport and healthy living more inclusive than ever: anyone can now train anywhere, at any time, with any coach – even sporting legends. Hyperlinks and QR codes further streamline client acquisition for fitness instructors (Trail et al., 2024).

On the other hand, the spread of AI technologies can undermine sport and healthy living, threatening public well-being. Society's shift from face-to-face interaction to AI-mediated digital communication reduces people's motivation to engage in physical activity (Midoglu et al., 2024). In these interactions, digital masks are becoming common: instead of real photos, users present images enhanced with graphic editors, flattering camera angles, or graphics unrelated to their appearance (e.g., drawings or animal pictures) (Liu & Jin, 2024).

While this boosts inclusiveness communicating behind digital masks lowers social expectations regarding health and appearance, removing incentives to pursue sports and healthy habits (Wang, 2024).

AI-enabled smart speakers are emerging as engaging conversational partners that shape worldviews. Their popularity is set to grow. However, society has yet to determine how AI advice and interaction will influence attitudes toward sports and healthy living across social groups (Chen & Dai, 2024).

Moreover, the need to continually bridge gaps in digital competence leaves technocratic societies little time for healthy living, while the stress of mass layoffs and the obsolescence of professions displaced by AI further deters healthy habits. People lack the willpower and time for sport and healthy living. Moreover, they lack the financial resources, which are redirected toward purchasing ever-new digital devices (Giorgino et al., 2024).

Thus, the consequences of AI proliferation for sport and healthy living remain contradictory and unclear, making this an important area for scientific inquiry. This research seeks to determine AI's impact on sports development and promotion of healthy living and propose recommendations for optimizing that impact, using Russia as a case study.

2. LITERATURE REVIEW

2.1. Humanistic Concept of a Healthy Lifestyle within the Sports Economy

The theoretical foundation of this research is the humanistic concept of a healthy lifestyle within the sports economy, whose scholarly content is detailed in the works of Alghamdi and Aldossari (2024), Liao et al. (2023), Lim et al. (2024), and Schulenkorf and Siefken (2019). This concept emphasizes the critical role of progressive, widespread physical culture in driving social progress, for which the following arguments are offered.

Obesity is a global challenge of the 21st century, confronting progressive societies and high-tech economies. It stems from sedentary lifestyles, made worse by the automation of tasks once requiring physical labor, and stress-related eating amid an abundance of calorie-dense foods promoted by aggressive marketing (Lin & Liu, 2023).

Government campaigns against harmful habits have delivered measurable gains (Tézier et al., 2025). Yet, instead of adopting healthy lifestyles, many people simply swap one vice for another perceived as less harmful (Chrétien et al., 2023). Examples include replacing cigarettes with vaping, which is known to cause serious respiratory illnesses, or substituting smoking with stress-induced overeating (Eime et al., 2025).

As interest in sports declines, numerous diseases are manifesting at younger ages (Rodríguez García et al., 2025). The COVID-19 pandemic and its associated lockdown severely affected the sports economy by forcing gyms to close for self-isolation (Litvinova, 2022).

The worldwide recognition of sport and healthy living as universal values is evident in several Sustainable Development Goals (SDGs), particularly SDGs 2 and 3 (Astanakulov et al., 2022; Kazambayeva et al., 2023; Tursunov et al., 2022). SDG 9 is also cited, highlighting the tight linkage between the development of physical culture and artificial intelligence in contemporary technocratic society.

Within the humanistic concept of a healthy lifestyle in the sports economy (the framework used in this research), physical culture in contemporary socio-economic systems is assessed using three principal criteria:

- Victories in officially recognized international sports competitions, which inspire national pride in countries excelling in global athletics. Such victories include, particularly, medal finishes achieved by national teams at the Olympic Games (Nyikana & Tichaawa, 2023; Van Hoye et al., 2025);
- The population's overall physical fitness and health, emphasizing the embrace of healthy living and the popularity of sports. Indicators include the prevalence

of hunger and obesity (DeLuca et al., 2025; Schnitzer et al., 2025);
- The state's geoeconomic strength derived from prestigious national sports achievements on the world stage. Evidence includes hosting esteemed international sporting events – such as the 2014 Sochi Winter Olympics, the 2018 FIFA World Cup in Russian cities, and the forthcoming 2025 World Friendship Games in Moscow and Yekaterinburg (Lamamr et al., 2025; Licen & Cermelj, 2025; Murayama et al., 2025).

These criteria make it possible to quantify the benefits of physical culture for public well-being, forming a statistical foundation for the sports economy that offers the most objective and precise picture of the current state, development trends, and cross-country differences in sports and healthy living.

2.2. AI within the Cyber-Social System of the Sports Economy

Cyber-social systems have taken shape in the sports economy with the advent of the Fifth Industrial Revolution. AI is firmly embedded within them. However, its role remains contradictory and unclear because research on this topic is still insufficient, representing a gap in the scholarly literature that this research aims to fill. Closing this gap is crucial. Without it, the predictive and managerial capacity of state social policy for regulating the sports economy is greatly diminished.

In Russia, the Decade of Action coincides with the "Decade of Science and Technology" (Ergasheva et al., 2024; Presidential Executive Office of Russia, 2022). Accordingly, the national course launched in 2020 and running through 2030 to advance physical culture (Government of the Russian Federation, 2020) must systemically embody sustainability (in line with the SDGs) and high-tech sophistication (in line with AI diffusion) within the sports economy (Popkova et al., 2018). This requires a highly effective scientific and methodological toolkit for regulating the AI-driven sports economy, preceded by a thorough theoretical examination of its causal relationships.

The desire to harmonize social and technological progress in pursuit of greater public welfare motivated this research. Its starting point is the set of the following AI-diffusion determinants identified in the existing literature:
- Social determinant: A qualified Industry 5.0 workforce, widespread digital literacy, and public acceptance of smart technologies (D_{AI1}) (Bogoviz, 2020; Lobova et al., 2020);
- Infrastructure determinant: The advancement, accessibility, and universal adequacy of computer equipment and the digital economy's energy capacity for ubiquitous AI use (D_{AI2}) (Wang et al., 2025);
- Regulatory determinant: Detailed, internally consistent legal acts for the digital economy and their social support (D_{AI3}) (Ali et al., 2025);
- Research determinant: The degree to which smart technologies are developed in academic settings (D_{AI4}) (Mukhomorova et al., 2020);
- Technological determinant: The intensity of breakthrough smart technology development and its intellectual property protection (D_{AI5}) (Vanchukhina et al., 2022);
- Budgetary determinant: The scale of public funding for the national AI development strategy (D_{AI6}) (Przhedetskiy et al., 2019);
- Venture determinant: Private-sector investment and innovation initiative in commercializing AI projects (D_{AI7}) (Samieva et al., 2023).

The accumulated literature shows the impact of AI on the sports economy in varying ways. Some scholars, including Kurolov (2022) and Przhedetsky et al. (2021), note that, as in other areas of economic activity and social interaction, the sports economy is undergoing digitalization driven by the transition to Industry 5.0. Smart technologies create new avenues for promoting and engaging in physical culture. In turn, pursuing sports and a healthy lifestyle allows members of a technocratic society to distinguish themselves favorably.

Supporting this view is the growing diversity and expanding functionality of smart digital devices that foster physical culture. AI-equipped fitness machines (e.g., treadmills and ellipticals) are interactive: they receive data from athletes and, based on it, select a training mode tailored to each individual's characteristics (Wei & Yi, 2025).

Smartwatches and smart scales allow athletes to monitor training intensity in real-time (e.g., duration and load level), track health indicators (e.g., heart rate), and measure performance metrics (e.g., distance covered, calories burned, weight change, and body composition shifts). If critical thresholds are exceeded, the AI can advise the athlete to reduce the load and, in an emergency, automatically summon medical services. These data are stored and analyzed over time by self-learning smart fitness devices (Musat et al., 2024).

Other researchers, including Mkrtchyan et al. (2024) and Petersen et al. (2025), note that the high social value and appeal of sports and a healthy lifestyle do not guarantee mass participation. In a technocratic society, there is a risk that physical culture will become elitist. Evidence for this is that, instead of encouraging and supporting sport, the promotion of physical culture in state social policy has turned into a nominal struggle against the "institutional traps" of the technocracy – gyms lying outside people's comfort zones, high stress, the widespread availability of fast food, "digital masks," and various forms of computer addiction.

A close examination of these studies confirms the strength of their arguments. Therefore, this research advances the hypothesis that AI has an ambiguous impact on the development of sports and healthy living: its effects on the popularity of sports and healthy lifestyles vary across the determinants of AI diffusion. To test this hypothesis on a rigorous basis, the research surveys

international experience with AI's influence on physical culture, with particular attention to Russian practice within the sports economy.

3. MATERIALS AND METHODOLOGY

To capture the latest global advances in the sports economy amid the Fifth Industrial Revolution, the research sample comprises the top 20 "greatest sporting nations" of 2024–2025 (Greatest Sporting Nation, 2025), including Russia. In the first stage, the research develops a quantitative-qualitative model of the sports economy's cyber-social system, highlighting AI's place and role within it.

To guarantee the model's reliability, it rests on official international statistics for 2024 and is built using robust econometric methodology. Regression analysis quantitatively measures the impact of the seven identified AI-diffusion determinants (D_{AI1-7}) as assessed by Tortoise (2025) on the level of physical-culture development in contemporary socio-economic systems. This level is evaluated by three criteria: national teams' victories in officially recognized international sporting events (WRCES), the population's overall physical fitness and health, focusing on healthy lifestyle adoption and the popularity of sports (WFCR), and the state's geoeconomic power based on prestigious world-class sporting achievements (WSPI), according to World Sports Rankings (2025). The data examined are presented in Table 1.

Table 1. Baseline 2024 statistics for the top 20 "Greatest Sporting Nations"

Country	Criteria for the level of physical culture development			Determinants of AI diffusion, score 0–100						
	WRCES, thousand points	**WFCR, points**	**WSPI, points**	**Talent**	**Infrastructure**	**Operation environment**	**Research**	**Development**	**Government strategy**	**Commercial**
				D_{AI1}	**D_{AI2}**	**D_{AI3}**	**D_{AI4}**	**D_{AI5}**	**D_{AI6}**	**D_{AI7}**
Australia	778443	86440	23606	17	22	77	14	16	29	11
Austria	322580	85803	9752	15	22	61	9	3	33	6
Canada	657182	89744	24538	26	27	75	15	14	70	23
China	926733	89153	24241	26	66	70	54	69	66	48
Denmark	398947	85000	10390	17	25	75	7	5	44	9
Finland	352977	82453	7608	17	33	81	9	13	39	13
France	1386924	93036	38900	25	31	70	18	31	59	19
Germany	782558	92960	32325	35	32	83	16	14	59	17
UK	1209710	87291	48000	32	27	90	23	12	65	25
Italy	1086311	92423	36530	16	23	100	7	2	53	5
Japan	930963	94575	20778	15	46	54	8	13	54	13
Latvia	242451	76995	4035	5	19	50	2	0	5	1
Netherlands	594487	87772	15078	23	40	67	10	11	43	10
New Zealand	505678	78933	9116	10	23	55	4	4	7	4
Norway	432616	83514	11900	14	25	84	7	2	41	11
Russia	345556	63183	7768	4	20	67	3	11	41	5
Serbia	440246	78291	10600	7	17	36	2	0	34	1
Slovenia	315900	78954	5258	8	22	76	5	0	28	5
Sweden	487366	89406	12162	17	26	88	8	5	23	12
Switzerland	394694	91074	12086	30	34	50	18	11	18	12
USA	2002738	89318	93900	100	100	96	100	100	83	100

Source: Developed by the authors based on the materials from Tortoise (2025) and World Sports Rankings (2025).

The impact of AI on sports development and the promotion of healthy lifestyles is assessed based on the values of the regression coefficients. Positive regression coefficients are the desired outcomes; their presence and number distinguish the various AI-diffusion determinants. Correlation analysis is then used to measure the collective contribution of these determinants to the development of physical culture in today's socio-economic systems, criterion by criterion.

To reveal how differently the AI-diffusion determinants affect the popularity of sports and healthy living, the authors applied variance analysis. This method gauges the variability of regression coefficients across determinants and sports-economy criteria. If the coefficients of variation exceed 50%, and if positive and negative regression coefficients are present, the hypothesis is considered confirmed.

In the second step, the authors constructed scenarios for the evolution of Russia's sports economy according to the spread of AI. Trend analysis yields a two-year trend for WRCES, WFCR, and WSPI (the latter two calculated since 2022) as the ratio of their values in 2024 to those in 2022. The base year 2024 is labeled "t," while the data from 2022 are labeled "t-2." Direct (2024 ÷ 2022) and

inverse (2022 ÷ 2024) trends are considered when selecting alternative scenarios.

The identified two-year trends are extrapolated to subsequent two-year intervals – 2026 (t+2), 2028 (t+4), and 2030 (t+6). The scenario that promises the greatest increase in sports-economy development is chosen. Using the previously established regression relationships, an automatic selection procedure identifies the most promising combination of AI-diffusion determinants to make this optimal scenario economically feasible.

Ultimately, a "roadmap" for AI development is drafted to optimize its influence on Russia's sports economy under the optimistic scenario through 2030. It sets target values for the AI-diffusion determinants at each of the three milestones – 2026, 2028, and 2030. To ensure these targets are attainable, the overall planned increase in $D_{AI1–7}$ under the optimal scenario is evenly distributed across the three stages (i.e., divided by three).

4. RESULTS

4.1. A Model of the Cyber-Social System of the Sports Economy and the Position and Role of AI Within It

During the first stage of this research, the authors compiled a quantitative-qualitative model of the cyber-social sports-economy system, highlighting the place and role of AI within it, which is presented in Table 2.

Table 2. Summary econometric statistics

Regression	WRCES	WFCR	WSPI	Average	Variation, %
Y-intercept	-16.23	63.69	-5.45		
D_{AI1}	16.43	0.34	0.85	5.87	155.83
D_{AI2}	-4.78	0.37	-0.42	-1.61	-172.10
D_{AI3}	2.92	0.08	0.10	1.03	158.08
D_{AI4}	-0.002	0.34	0.37	0.24	87.47
D_{AI5}	15.42	-0.07	0.19	5.18	171.08
D_{AI6}	7.72	0.18	0.28	2.73	158.62
D_{AI7}	-16.66	-0.89	-0.37	-5.97	-155.02
Average	3.01	0.05	0.14	-	-
Variation, %	387.16	917.74	303.90	-	-
Multiple R	0.8764	0.6683	0.9440	-	-

Source: Developed by the authors.

Regression statistics from Table 2 provide a quantitative picture of how the seven identified determinants of AI diffusion influence the development of physical culture in today's socio-economic systems. A one-point increase in the social determinant of AI boosts the victories of national teams in officially recognized international sports competitions by 16.43 thousand points, raises overall physical fitness and public health by 0.34 points, and strengthens the state's geoeconomic power (rooted in prestigious world-class sporting achievements) by 0.85 points. The coefficient of variation for D_{AI1} is 155.83%.

A one-point rise in the infrastructure determinant of AI improves overall physical fitness and health by 0.37 points. However, it reduces national sports victories by 4.78 thousand points and weakens geoeconomic power by 0.42 points. The coefficient of variation for D_{AI1} equaled -172.10%.

A one-point increase in the regulatory determinant of AI adds 2.92 thousand points to national sports victories, lifts overall physical fitness and health by 0.08 points, and strengthens geoeconomic power by 0.10 points. The coefficient of variation for D_{AI3} is 158.08%.

Adding one point to the research determinant of AI raises overall physical fitness and health by 0.34 points and geoeconomic power by 0.37 points but reduces national sports victories by 0.002 thousand points. The coefficient of variation for D_{AI4} is 87.47%.

A one-point gain in the technological determinant of AI boosts national sports victories by 15.42 thousand points and geoeconomic power by 0.19 points. Nevertheless, it lowers overall physical fitness and health by 0.07 points. The coefficient of variation for D_{AI5} is 171.08%.

An additional point in the budgetary determinant of AI increases national sports victories by 7.72 thousand points, improves overall physical fitness and health by 0.18 points, and enhances geoeconomic power by 0.28 points. The coefficient of variation for D_{AI6} is 158.62%.

The venture determinant of AI shows no statistically significant positive impact on physical-culture development: all three regression coefficients linked to D_{AI7} (i.e., WRCES, WFCR, and WSPI) are negative. The coefficient of variation for D_{AI1} is 155.02%.

The victories of national teams in officially recognized international competitions are 87.64 % determined by AI, with a coefficient of variation of 387.16% for WRCES. Overall physical fitness and public health are 66.83% determined by AI. The coefficient of variation for WFCR is 917.74%. The state's geoeconomic power is 94.40% determined by AI, with a coefficient of variation of 303.90% for WSPI.

Thus, all coefficients of variation exceed 50%. Positive and negative regression coefficients are present, confirming the hypothesis and revealing a high degree of differentiation in how AI-diffusion determinants affect the popularity of sports and healthy living.

4.2. Scenarios for the Development of Russia's Sports Economy Depending on AI Diffusion

In the second phase of the research, the authors analyzed data from Table 1 using trend analysis. Two-year trends

in the evolution of Russia's cyber-social sports-economy system were calculated: direct trends (the ratio of 2024 values to those of 2022) and inverse trends (the ratio of 2022 values to those of 2024). The direct trends showed a decline. Thus, the scenario based on them is termed pessimistic. The inverse trends, by contrast, are positive and form the basis of the optimistic scenario (Table 3).

Table 3. Alternative scenarios for the development of the sports economy in Russia depending on the spread of AI until 2030.

Scenario	Scenario values	Criteria of the level of physical culture development		
		WRCES, thousand points	WFCR, points	WSPI, points
Base (actual)	2022 (t-2)	840.72	89.23	12.38
	2024 (t)	345.56	63.18	7.77
Pessimistic	Two-year trend	0.41	0.71	0.63
	2026 (t+2)	142.03	44.74	4.87
	2028 (t+4)	58.38	31.68	3.06
	2030 (t+6)	24.00	22.43	1.92
Optimistic	Two-year trend	2.43	1.41	1.59
	2026 (t+2)	840.72	89.23	12.38
	2028 (t+4)	2045.40	126.01	19.73
	2030 (t+6)	4976.33	177.96	31.44

Source: Developed by the authors.

The pessimistic scenario in Table 3 rests on direct two-year trends, according to which in 2024, Russia's WRCES was 0.41 of its 2022 level, WFCR 0.71, and WSPI 0.63. Under this scenario, the national team's victories in officially recognized international sports competitions fell from 345.56 thousand points in 2024 (t) to 142.03 thousand points in 2026 (t+2), to 58.38 thousand points in 2028 (t+4), and to 24.00 thousand points in 2030 (t+6).

The population's overall physical fitness and health drop from 63.18 points in 2024 (t) to 44.74 points in 2026 (t+2), to 31.68 points in 2028 (t+4), and to 22.43 points in 2030 (t+6). Russia's geoeconomic power—rooted in its prestigious world-class sporting achievements – shrinks from 7.77 points in 2024 (t) to 4.87 points in 2026 (t+2), to 3.06 points in 2028 (t+4), and 1.92 points in 2030 (t+6).

By contrast, the alternative optimistic scenario based on inverse two-year trends assumes that, relative to 2022 (t0), Russia's 2024 (t) WRCES rises 2.43-fold, WFCR 1.41-fold, and WSPI 1.59-fold. Under this scenario, the national team's victories grow from 345.56 thousand points in 2024 (t) to 840.72 thousand points in 2026 (t+2), 2045.40 thousand points in 2028 (t+4), and 4 976.33 thousand points in 2030 (t+6).

Overall physical fitness and public health improved from 63.18 points in 2024 (t) to 89.23 points in 2026 (t+2), 126.01 points in 2028 (t+4), and 177.96 points in 2030 (t+6). Russia's geoeconomic power strengthens from 7.77 points in 2024 (t) to 12.38 points in 2026 (t+2), 19.73 points in 2028 (t+4), and 31.44 points in 2030 (t+6).

Drawing on the regression statistics from Table 2 and using an automatic selection procedure, the authors identified a promising combination of AI-diffusion determinants that will forestall the pessimistic scenario and enable the optimistic scenario for Russia's sports economy through 2030 (Figure 1).

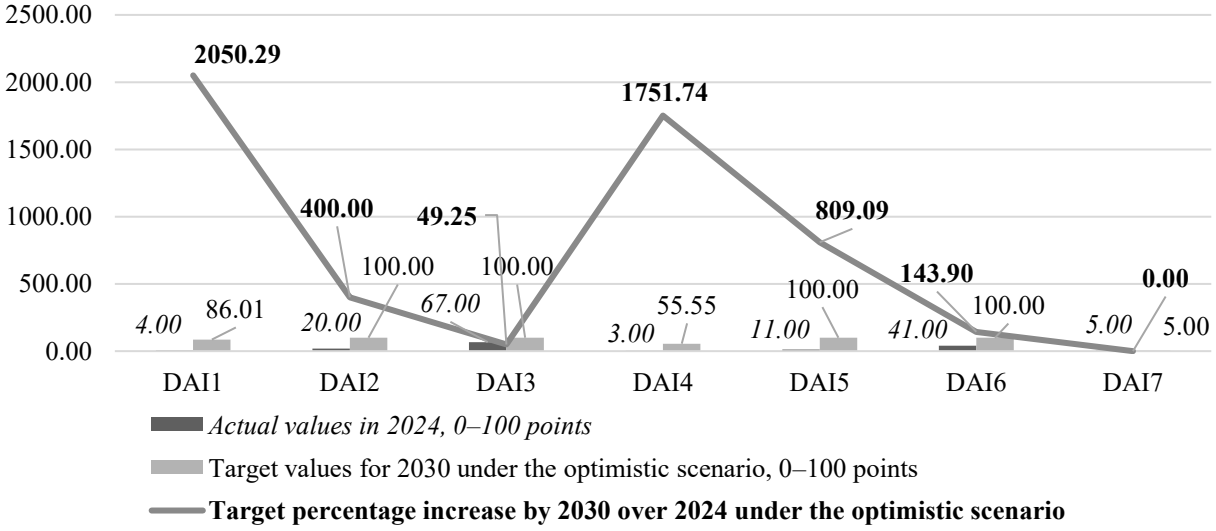

Figure 1. Target benchmarks for AI development to optimize its impact on Russia's sports economy under the optimistic scenario through 2030

Source: Developed by the authors.

Referring to Figure 1, the following recommendations are offered for enhancing state socio-economic policy on AI development to optimize its impact on Russia's sports economy under the optimistic scenario through 2030:

- Increase the social determinant of AI by 2050.29%, from 4.00 points in 2024 to 86.01 points by 2030;
- Expand the infrastructure determinant of AI by 400.00%, from 20.00 points in 2024 to 100.00 points by 2030;
- Strengthen the regulatory determinant of AI by 49.25%, from 67.00 points in 2024 to 100.00 points by 2030;
- Raise the research determinant of AI by 1751.74%, from 3.00 points in 2024 to 55.55 points by 2030;
- Boost the technological determinant of AI by 809.09%, from 11.00 points in 2024 to 100.00 points by 2030;
- Increase the budgetary determinant of AI by 143.90%, from 41.00 points in 2024 to 100.00 points by 2030;
- Keep the venture determinant of AI steady at its 2024 level through 2030 (5.00 points).

The AI development "roadmap" (Figure 2) will help achieve these optimistic targets by 2030.

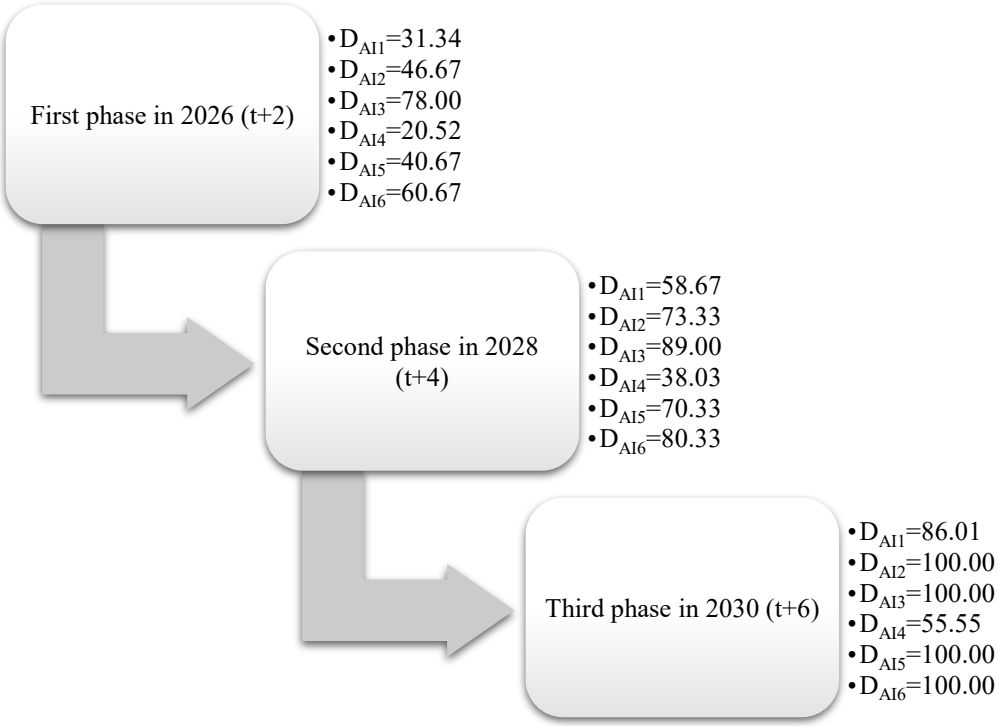

Figure 2. Roadmap for the development of AI to optimize its impact on Russia's sports economy under the optimistic scenario through 2030
Source: Developed by the authors.

Since the baseline values for 2024 (t) and the strategic targets for 2030 (t+6) have already been specified, they should now be supplemented with interim control values. According to the roadmap shown in Figure 2, the plan is as follows:

- Increase the social determinant of AI to 31.34 points in 2026 (t+2) and 58.67 points in 2028 (t+4);
- Expand the infrastructure determinant of AI to 46.67 points in 2026 (t+2) and 73.33 points in 2028 (t+4);
- Strengthen the regulatory determinant of AI to 78.00 points in 2026 (t+2) and 89.00 points in 2028 (t+4);
- Increase the research determinant of AI to 20.52 points in 2026 (t+2) and 38.03 points in 2028 (t+4);
- Increase the technological determinant of AI to 40.67 points in 2026 (t+2) and 70.33 points in 2028. (t+4);
- Increase the budgetary determinant of AI to 60.67 points in 2026 (t+2) and 80.33 points in 2028 (t+4).

5. DISCUSSION

Building on the works of Alghamdi and Aldossari (2024), Liao et al. (2023), Lim et al. (2024), and Schulenkorf and Siefken (2019), the results presented in this research enrich the literature and extend the humanistic concept of a healthy lifestyle within the sports economy by clarifying the impact of AI diffusion on sports development and the promotion of healthy living, and by quantitatively measuring these effects for 2024 (Table 4).

Table 4. Quantitative measurement of AI's contribution to sports development and the promotion of a healthy lifestyle in 2024

Determinants of AI proliferation	Impact on the sports economy, including healthy lifestyles (regression)				
	Victories in officially recognized international sports competitions (WRCES)	Level of overall physical fitness and public health (WFCR)	Geoeconomic power of the state based on world-class sporting achievements (WSPI)	Average	Variation, %
Social (D_{AI1})	16.43	0.34	0.85	5.87	155.83
Infrastructure (D_{AI2})	-4.78	0.37	-0.42	-1.61	-172.10
Regulatory (D_{AI3})	2.92	0.08	0.10	1.03	158.08
Research (D_{AI4})	-0.002	0.34	0.37	0.24	87.47
Technological (D_{AI5})	15.42	-0.07	0.19	5.18	171.08
Budgetary (D_{AI6})	7.72	0.18	0.28	2.73	158.62
Venture (D_{AI7})	-16.66	-0.89	-0.37	-5.97	-155.02
Average	3.01	0.05	0.14	-	-
Variation, %	387.16	917.74	303.90	-	-

Source: Developed by the authors.

The results obtained in this research, summarized in Table 1, make it possible to classify AI-diffusion determinants by their contribution to the development of physical culture and to group them into three categories.

The first category includes leading determinants of AI diffusion that systemically raise the level of physical culture in contemporary socio-economic systems across all three criteria. It includes the following:

- Social determinant: All regression coefficients for D_{AI1} are positive; their arithmetic mean is 5.87 with a variation of 155.83 % (confirming the findings of Bogoviz (2020) and Lobova et al. (2020));
- Regulatory determinant: All regression coefficients for D_{AI3} are positive; their arithmetic mean is 1.03 with a variation of 158.08 % (confirming the results obtained by Ali et al. (2025));
- Budgetary determinant: All regression coefficients for D_{AI6} are positive; their arithmetic mean is 2.73 with a variation of 158.62 % (confirming the finding of Przhedetskiy et al. (2019)).

The second category includes supplementary determinants of AI diffusion that moderately support the development of physical culture in today's socio-economic systems. This category includes the following:

- Research determinant: Two of the three regression coefficients for D_{AI4} (those for WFCR and WSPI) are positive; their arithmetic mean is 0.24 with a variation of 87.47 % (contrary to the findings of Mukhomorova et al. (2020));
- Technological determinant: Two of the three regression coefficients for D_{AI5} (those for WRCES and WSPI) are positive; their arithmetic mean is 5.18 with a variation of 171.08 % (contrary to the findings of Vanchukhina et al. (2022)).

The third category includes determinants of AI diffusion that affect the development of physical culture in modern socio-economic systems in a contradictory manner. They are as follows:

- Infrastructure determinant: The regression coefficient for D_{AI2} is positive only for WFCR; the arithmetic mean of these coefficients is −1.61 with a variation of −172.10% (contrary to the findings of Wang et al. (2025));
- Venture determinant: All regression coefficients for D_{AI7} are negative; their arithmetic mean is −5.97 with a variation of −155.02% (contrary to the findings of Samieva et al. (2023)).

The average regression-based contribution of AI-diffusion determinants to national victories in officially recognized international sports competitions (WRCES) is substantial (3.01) with a variation of 387.16 % (confirming the findings of Nyikana and Tichaawa (2023) and Van Hoye et al. (2025)). Relative to the population's overall physical fitness and health (WFCR), this indicator is moderate (0.05), with a variation of 917.74% (contrary to the findings of DeLuca et al. (2025) and Schnitzer et al. (2025)). Relative to the state's geoeconomic power derived from world-class sporting achievements (WSPI), it is likewise moderate (0.14), with a variation of 303.90% (contrary to the findings of Lamamr et al. (2025), Licen and Cermelj (2025), and Murayama et al. (2025)).

Thus, in line with Kurolov (2022), Mkrtchyan et al. (2024), Musat et al. (2024), Petersen et al. (2025), Przhedetsky et al. (2021), and Wei and Yi (2025), this research confirmed the hypothesis that AI exerts an ambiguous influence on the development of sport and healthy lifestyles.

6. CONCLUSION

Thus, drawing on the progressive experience of the top 20 "greatest sporting nations" in 2024–2025, this research has quantitatively measured and qualitatively described AI's impact on sports development and promoting healthy lifestyles. Moreover, it has offered recommendations to optimize this impact in Russia, thereby fulfilling the goal of this research. The theoretical value of this research lies in the cyber-social model of the

sports economy that has been developed, which demonstrates AI's significant yet contradictory role. Scientific novelty also resides in the author's classification of AI-diffusion determinants, created in line with the model and clarifying the relationship between physical-culture development and AI in today's technocratic society.

The principal finding is that AI's effects on the popularity of sport and healthy living vary across diffusion determinants: the social, regulatory, and budgetary determinants are primary; the research and technological determinants are supplementary; and the infrastructure and venture determinants are of minor importance.

This conclusion uncovers previously unknown causal links in the evolution of the AI-driven sports economy, deepening its theoretical understanding. The socio-humanitarian significance of the article's proposals is that they support the sustainable development of the AI sports economy, particularly by accelerating progress toward SDGs 2 and 3, which concern sport and healthy living, and SDG 9, which concerns AI diffusion.

The practical value of the study's applied contributions is their potential to harmonize social and technological progress in the shared pursuit of greater well-being within the AI sports economy. For Russia, the benefits are as follows:

- Alternative scenarios for the development of the sports economy to 2030, depending on AI diffusion;
- Target benchmarks for AI development to optimize its influence on the sports economy under an optimistic scenario to 2030;
- A roadmap for AI development that will achieve this optimization over the same period.

Collectively, these applied solutions form a flexible, highly effective methodological toolkit for regulating Russia's AI-driven sports economy. This will enable the systematic integration of sustainability (in SDG terms) and high-tech advancement (in AI-diffusion terms) into the sports economy as the nation pursues its physical-culture agenda to 2030 (Government of the Russian Federation, 2020).

- The main limitation of this research is its applied focus on the experience and prospects of Russia's AI sports economy. The forecasts and recommendations cannot be directly transferred to other members of the top 20 "greatest sporting nations." Nevertheless, the cyber-social model of the sports economy developed is universal and robust for all twenty nations. Based on this model, it would be worthwhile to identify scenarios, set target benchmarks, and draft AI-development roadmaps to optimize AI's influence on physical culture in advancing sports and promoting healthy lifestyles in the remaining countries.

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