Geographical Analysis of Team Sports as a Strategy for Developing Sports Industry Regions in Egypt Using GIS

Assoc. Prof. Dr. Khaled Ibrahim Muhammad Badra **(1)**
Assoc. Prof. Dr. Mohamed Ahmed Ali Soliman **(2)**
Assoc. Prof. Dr. Ali, Ahmed Ali Ahmed Ali **(3)**

ABSTRACT

Background: Sports activity is a form of human expression and organization. Sport is an important part of everyday life and has become a rapidly growing global industry. Because sports activities have spatial dimensions, sport has acquired scientific legitimacy in the field of geography due to the ability of geography to provide better insight into sporting problems through spatial analysis of them.

Problem: Based on the fact that sports are spatial activities, and that geography and sports activities are closely related, and in recognition of the vital role that geography plays in the different spatial patterns of the sports practiced according to various geographical environments, the research problem focused on providing an in-depth analysis of the regions of sports activities for team sports in Egypt's youth centers.

Objectives: To identify the spatial distribution pattern of youth centers, highlight the relative importance of team sports in the structure of Egyptian sports activities, analyze the regional distribution patterns of team sports activities, leading to the geospatial zoning of the player production map in youth sports centers in Egypt, and opening up the field to examine the impact of spatial differences in sports, and highlighting the role of place as an effective element in sports activities practiced in various geographical environments.

Methodology: In addition to spatial analysis method, the study relied on spatial statistical methods and utilized geographic information systems techniques in building models for modeling team sports activities in order to figure out and determine the geographical regions of these activities.

Results: The study presented a spatial analysis of team sports activities practiced in Egypt, a map of player productivity in youth centers in Egypt, and a spatial geospatial regionalization of team sports. It emphasized that the broad umbrella of geography has produced

(1) Department of Geography & GIS, Faculty of Arts - Assiut University, Egypt.
(2) Department of Geography Institute of African Studies and Nile Basin Countries, Aswan University, Egypt. **For Correspondence:** e-mail: ahmed.ali@aun.edu.eg.
(3) Department of Geography & GIS, Faculty of Arts - Assiut University, Egypt.

diversity in sports activities practiced in Egypt, and the results of geospatial regionalization can be relied on to explore sports talents to participate in international sports events and develop the sports industry in Egypt.

Keywords: Sports industry, Spatial regionalization, Team games, Player productivity, Egypt.

Introduction:

In recent years, the importance of sports has taken on a new dimension, as it has been increasingly used as an effective tool for soft power and political diplomacy because wide-range sports events provide international recognition and symbolic power for the organizing state *(Al-Emadi, 2022)*. The sports industry is classified as a social and economic accomplishment for societies that have paid attention to this industry for the purpose of investing in it and winning medals in major sports competitions *(Savić, 2006)*. Sports events are no longer just collective meetings, but have become a global industry, with a direct impact on urban renewal *(Burbank et al, 2002)*, tourism *(Degen, 2004)*, in addition to the international status of the countries hosting them *(Ahlert, 2006)*.

The World Tourism Organization confirms that sports are indeed a powerful tool for increasing investments in infrastructure projects, and represent complementary activities for promoting sustainable economic development of tourist destinations *(WTO, 2001)*. Research on sports tourism indicates that sport has become a rapidly growing global tourist industry. Analysts have expected that it will provide a tourist market that could grow at an annual rate of up to 60% starting from 2017 *(de Menezes & de Souza, 2014)*.

Problem:

Based on the fact that sport is considered a spatial activity, and geography and sports activities are closely related, geographic resources have a clear and significant impact on sports. The location, its geography, and the characteristics of its population are factors that influence the size and type of sports. The location also plays a vital role in the quality of sports practiced based on the local environments, which makes the research hypothesis of the study revolve around the in-depth analysis of the regions of team sports activities in youth centers in Egypt to prove how the broad umbrella of geography has produced diversity in the sports activities practiced in different places. This contributes to drawing a new picture of the sports industry in Egypt.

Study Area:

According to the 1971 Constitution, the Arab Republic of Egypt was divided into 26 governorates, each of which includes a number of towns, cities, and villages. According to the 2006 census, the number of Egyptian cities reached 216, in addition to the city of Luxor which has a special character. On December 9, 2009, Presidential Decree No. 378 was issued to convert the Supreme Council of Luxor City into Luxor Governorate, including the towns of Esna and Armant as part of Qena Governorate (Official Gazette, 2009). Then, a decree was issued by the Prime Minister to make some modifications to the administrative divisions while keeping Luxor as an independent governorate, making the total number of Egyptian governorates 27, as shown in Figure (1).

Fig. 1: Administrative division of the study area 2022

Objectives:

In light of the research problem, the study aims to achieve the following:

- Identifying the spatial distribution pattern of youth centers in Egypt.
- Highlighting the relative importance of team sports in the structure of Egyptian sports activities.
- Analyzing the distribution patterns of team sports activities regionally, coming up with a geospatial regionalization of the player production map at youth sports centers in Egypt.
- Opening up a field to identify the impact of spatial differences in sports.
- Highlighting the role of place as an effective element in sports activities practiced in various geographical environments.

Literature Review:

Because sport is not a traditional topic of geographical research, research in this area has encountered obvious obstacles. Nevertheless, sport has gained scientific legitimacy in the field of geography, not only because of its social relevance, but also because of the ability of geography to contribute to a better understanding of sports problems through geographical analy1sis of them. *(Gil, 2012).*

Among the most important studies showing the extent of the correlation between geography and sport over the last 10 years are the study by *(Gil, et al., 2012)* entitled " Sport as a subject of geographic study and research " and the study by *(Karusisi, et al, 2013)* entitled “Spatial accessibility to specific sport facilities and corresponding sport practice.” *(Wainwright & Ansell, 2009)* presented a study entitled “Geographies of Sports Development: The Role of Space and Place in Sports Development Management. *(Ilieș et al., 2014)* conducted a study entitled "Sport and geography: the geography of sport. *(Suominen, 2017)* conducted a study entitled "The Geography of Sport in Finland". *(Shrestha, 2019)* conducted a study entitled " Spatial access to sport facilities from the multiple places visited and sport practice: Assessing and correcting biases related to selective daily mobility. Finally, *(Cook, 2021)* conducted a study entitled "Geographies of run-commuting in the UK”.

Methodology:

The study adopted several methods such as the Historical Method, the Analytical Descriptive Method, as well as the Spatial Analysis Method, which focuses on three axes: Location, Interaction, and Region. The study also adopted the spatial statistical methods and used GIS techniques to build models for modeling collective sporting activities, to figure out and identify the geographical regions of these activities in Egypt.

Discussion and Results:

1. Spatial variation of youth centers in Egypt:

Table (1) shows the distribution of youth centers in Egypt in 2022, the population aged (10-40 years), their relative distribution, the equality percentage between the two distributions, and the geographical correlation coefficient between them.

Table (1) and figure (2) show the spread of youth centers in their spatial distribution in all governorates of the Republic. Relative differences are observed in their spread from one governorate to another. The governorate of Dakahlia comes first, followed by El-Beheira, then El-Sharqia, and in fourth place comes El-Menoufia, followed by El-Gharbia. In sixth place comes Kafr El-Sheikh Governorate. The seven governorates include about half of the youth centers in Egypt (50.9%). Aswan governorate is the only governorate in Upper Egypt with a relative size exceeding 5% of the youth centers. The other remaining governorates have a relative size of less than 5%.

Table (1)

Geographical distribution of the numbers of youth centers and population in Egypt in 2022

Governorate	Population (10-40 years)		Youth centers		Ratio of equalization
	person	%	No.	%	
Cairo	4952697	10.12	93	2.13	(-) 7.99
Alexandria	2985008	6.1	45	1.03	(-) 4.97
Port-Said	375989	0.77	22	0.5	(-) 0.27
Suez	623370	0.76	23	0.53	(-) 0.23
Damietta	3210671	1.27	101	2.31	(+) 1.04
Dakahliya	3642033	6.56	430	9.83	(+) 3.27
Sharqeia	2959486	7.44	371	8.48	(+) 1.04
Kalyobiya	2030600	6.04	202	4.62	(+) 1.42
Kafr El Shiekh	2491120	4.15	241	5.51	(+) 1.36
Al Gharbya	2491120	5.09	282	6.45	(+) 1.36
Monofiya	2154664	4.4	283	6.47	(+) 2.07
El Beheira	3113768	6.36	381	8.71	(+) 2.35
Ismailia	654988	1.34	112	2.56	(+) 1.22
Giza	4475516	9.14	210	4.8	(-) 4.34
Bani Souwaif	1605669	3.28	176	4.02	(+) 0.74
Fayoum	1818966	3.71	136	3.11	(-) 0.60
Menia	2847123	5.81	158	3.61	(+) 2.20
Assiut	2296784	4.69	170	3.89	(-) 0.80
Sohag	2539549	5.19	175	4	(-) 1.19
Qena	1633696	3.34	181	4.14	(+) 0.90
Aswan	759757	1.55	240	5.49	(+) 3.94
Luxor	684470	1.32	62	1.42	(+) 0.10
The Red Sea	155568	0.32	19	0.43	(+) 0.11
New Valley	120451	0.25	69	1.58	(+) 1.33
Matrouh	218706	0.45	96	2.19	(+) 1.74
North Sinai	223233	0.46	71	1.62	(+) 1.16
South Sinai	52769	0.11	25	0.57	(+) 0.46
Total	48963872	100	4374	100	--
The geographical correlation is 0.760					

Source: Central Agency for Public Mobilization & Statistics (CAPMAS), 2022.

The distribution of the population has spatial prevalence in all governorates characterized by relative differences from one governorate to another. The distribution map of the youth centers differs from that of the population. The first seven governorates that have the largest relative share of the population include Cairo, Sharqia, Dakahlia, Beheira, Alexandria, Qalyubia, and Menia, respectively. The seven governorates comprise 48.4% of the population in Egypt. This means that only three governorates are repeated in the two groups. These differences, or relative variations, are due to the multiplicity of rural local units and the size of the population, as there is a positive correlation between them and the distribution of youth centers. These differences are also due to the prevalence of private sports facilities such as clubs and sports resorts, and there is an inverse relation between them and the distribution of youth centers as is the case in the governorates of Cairo and Alexandria.

When calculating the equality percentage between the proportional distribution of youth centers and population in Egypt, it became clear that the Egyptian governorates could be divided according to the equivalence ratio into the following three categories:

The first category: Governorates that have more than their equal proportional share of youth centers. These governorates have a level of over 1% and above. They include the governorates of Aswan, Dakahlia, Beheira, Matrouh, Menoufia, Kafr El-Sheikh, Ismailia, the New Valley, North Sinai, Sharkia, and Damietta. The governorates of this category comprise about 55% of the youth centers and about 34% of the population in Egypt.

The second category: Governorates that have a share ranging between + 1 and - 1% of the youth centers and they include nine governorates: Qena, Bani Souwaif, South Sinai, Red Sea, Luxor, Suez, Port Said, Fayoum, Assiut. The nine governorates have 19.5% of the youth centers and about 17.7% of the population in Egypt.

The third category: Governorates that have a share of less than 1% of the youth centers. They include: Cairo, Alexandria, Giza, Qalyubiya, and Sohag. These five governorates have 16.6% of the youth centers and 36.6% of Egypt's population.

Thus, it is clear that the equality percentage required to reach equal proportional distribution between youth centers and population in Egypt ranges from (-7.99%) in Cairo governorate to (+ 3.94%) in Aswan governorate, and when calculating the geographical correlation coefficient between the two distributions, it achieved 0.760, indicating

an average correlation in its strength between the two distributions. It is important to note that Egypt's population centers of gravity, in the governorates of Cairo, Alexandria and Giza, do not have the equal share of youth centers that is proportionate to their inhabitants. This can be accounted for by the spread of major sports clubs in them, the limited area of both Cairo and Alexandria, and the fact that the expansion of their youth centers must be in the desert margins easily accessible from the large residential neighborhoods of either governorate.

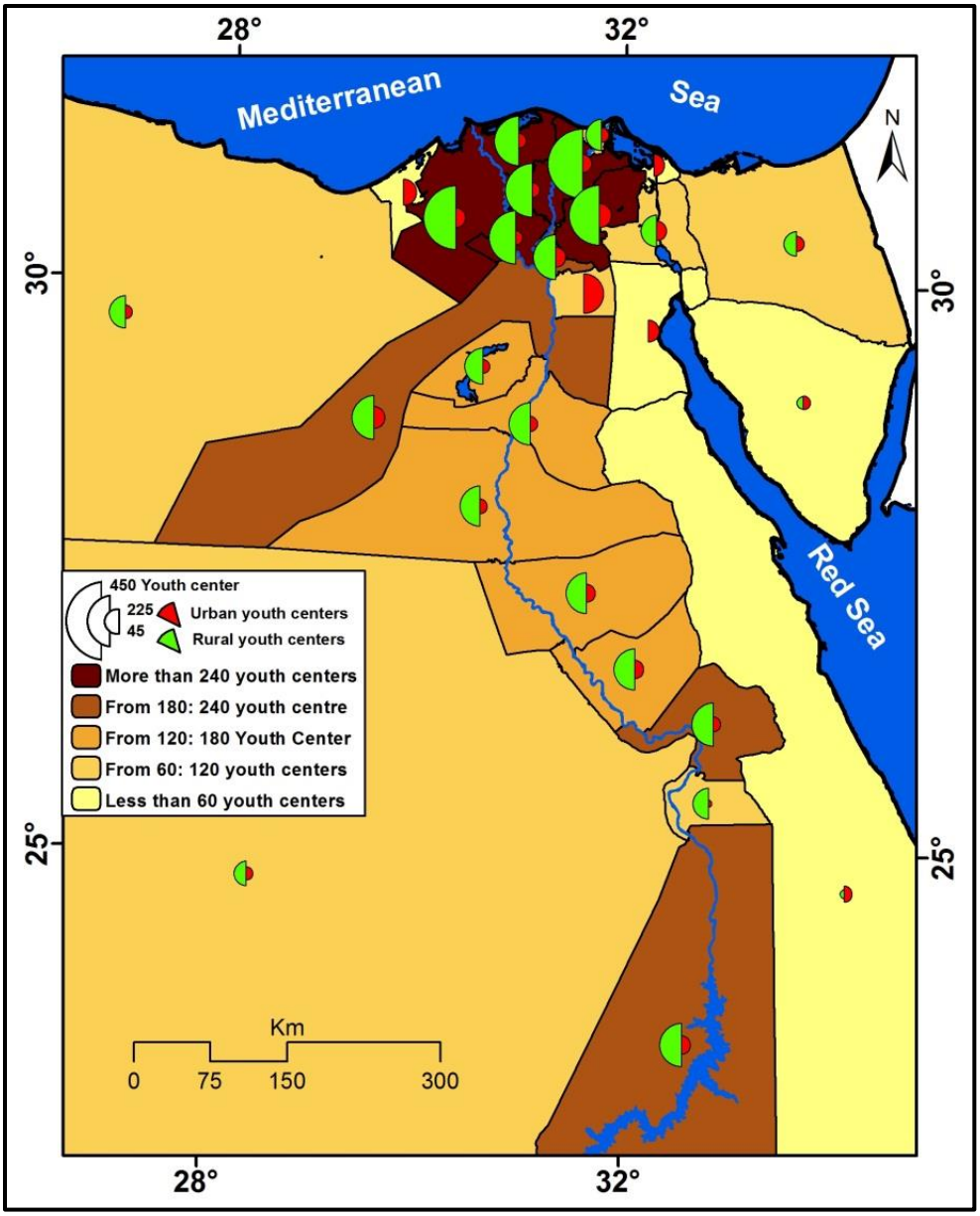

Fig. 2. Distribution of youth centers in Egypt

2. Human structure of sports activity in youth centers in Egypt:

The human structure of sports activity in Egypt can be divided into three groups: team games, single-player games and self-defense games as shown in the following table:

Table (2) and figure (3) show that in 2022, the number of players practicing games in youth centers was approximately 360.3 thousand, distributed to all youth centers in Egyptian governorates, and to main gaming groups in varying proportions, as follows:

Table (2)
Geographical distribution of the number of players according to the main gaming groups in youth centers in Egypt in 2022

Governorate	Team games		Single-player games		Self-defense games		Total	
	players	%	players	%	players	%	players	%
Cairo	10995	4,83	3564	7,86	8249	9,43	22808	6,33
Alexandria	4607	2,02	876	1,93	4841	5,54	10324	2,87
Port-Said	3027	1,33	416	0,92	2028	2,32	5471	1,52
Suez	1328	0,58	376	0,83	724	0,83	2428	0,67
Damietta	17223	7,57	1259	2,78	2108	2,41	20590	5,71
Dakahliya	17911	7,87	5933	13,08	8838	10,11	32682	9,07
Sharqeia	11111	4,88	1795	3,96	6198	7,09	19104	5,30
Kalyobiya	16615	7,30	6207	13,69	12315	14,08	35137	9,75
Kafr El Shiekh	2980	1,31	40	0,09	770	0,88	3790	1,05
Al Gharbya	8683	3,82	3322	7,33	3836	4,42	15841	4,40
Monofiya	5392	2,37	466	1,03	8355	9,55	14213	3,94
El Beheira	5784	2,54	623	1,37	333	0,38	6740	1,87
Ismailia	4928	2,17	1311	2,89	2889	3,30	9128	2,53
Giza	20296	8,92	3770	8,31	6738	7,71	30804	8,55
Bani Souwaif	8731	3,84	1877	4,14	3151	3,60	13759	3,82
Fayoum	4593	2,02	511	1,13	2031	2,32	7135	1,98
Menia	14873	6,54	2317	5,11	7577	8,67	24767	6,87
Assiut	11891	5,23	876	1,93	603	0,69	13370	3,71
Sohag	26127	11,48	4664	10,29	415	0,47	31206	8,66
Qena	6084	2,67	1207	2,66	1922	2,20	9213	2,56
Aswan	6062	2,66	142	0,31	442	0,51	6646	1,84
Luxor	4902	2,15	813	1,79	675	0,77	6390	1,77
The Red Sea	1114	0,49	84	0,19	810	0,93	2008	0,56
New Valley	2855	1,25	160	0,35	714	0,82	3729	1,03
Matrouh	3075	1,35	189	0,42	150	0,17	3414	0,95
North Sinai	5515	2,42	2085	4,60	509	0,58	8109	2,25
South Sinai	840	0,37	460	1.01	195	0,22	1495	0,42
Total	227542	100	45343	100	87443	100	360328	100

Source: Central Agency for Public Mobilization & Statistics (CAPMAS), 2022.

Team games: They constitute the largest part of the human structure of sports activity in Egypt, as they account for about 63.1% of the total number of youth center players in 2022. This is due to the nature of team games, and their capacity to absorb the largest number of players. These games include football, handball, volleyball, basketball, Ping pong, and tennis. More than half of the players of these

games (54.91%) are concentrated in only seven governorates: Sohag, Giza, Dakahlia, Damietta, Qalyubiya, Menia, and Assiut, respectively, which means that they represent the main region for team games in youth centers throughout the Republic. The remaining 20 governorates account for 45.09% of the number of players. The governorates of Suez, Red Sea and South Sinai are the lowest in terms of the number of the players of team games in youth centers with percentages of 0.58% and 0.49% and 0.37%, respectively.

Self-defense games: They rank second in the structure of sports activity in Egypt, as they account for nearly a quarter of the total number of the players of youth centers. Under this category of games fall judo, kung fu, karate, taekwondo. The main region for self-defense games is represented in seven governorates: Qalyubiya, Dakahlia, Menoufia, Cairo, Menia, Giza and Sharqia, respectively. These governorates together account for two thirds of the players who practice self-defense games in youth centers. The remaining third is distributed among other governorates, of which about 12 governorates have less than 1% self-defense players. They include the six border governorates: Matrouh, the New Valley, the Red Sea, North Sinai, South Sinai, Aswan, in addition to the governorates of Assiut, Sohag, Luxor, Kafr El-Sheikh, Beheira, and Suez.

Single-player games: They ranks third in the structure of Egyptian sports activity, with a percentage of 12.6% of the total number of youth center players in 2022. These games include boxing, wrestling, weightlifting, bodybuilding, athletics, gymnastics, speedball, croquet, billiards, and swimming. The governorate of Qalyubiya excels over other Egyptian governorates in the number of players of single-player games, followed by the governorates of Dakahlia, Sohag, Giza, Cairo, and Gharbia, respectively, where the six governorates together account for about 60.56% of the number of players of these games in youth centers, thus constituting a major region for single-player games. About 39.44% of these players are distributed among 21 governorates, the least of which are Port Said, Suez, Matrouh, New Valley, the Red Sea, Aswan, and Kafr el-Sheikh. Any of them has less than 1% of the number of the players of single-player games in youth centers in the Republic.

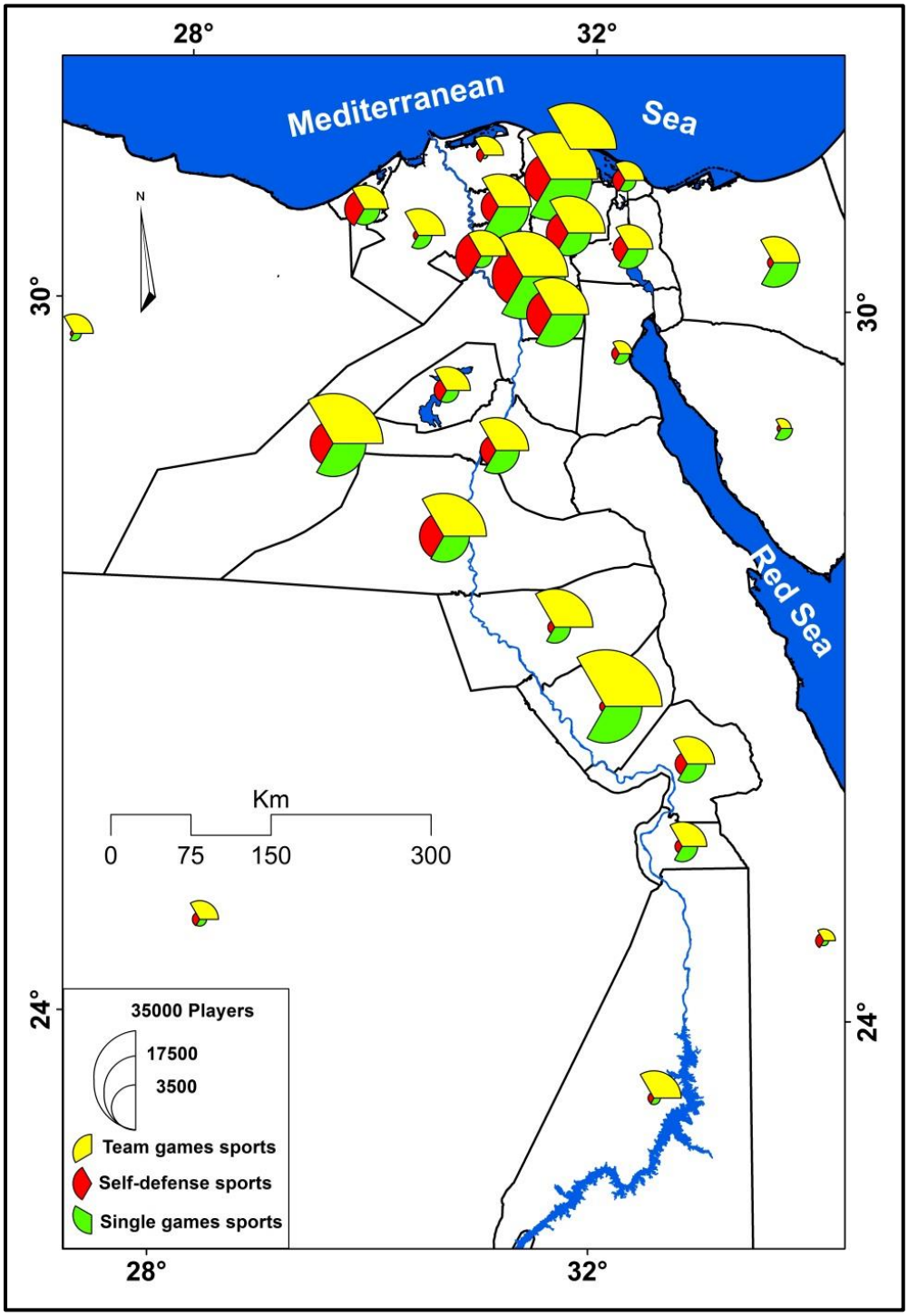

Fig. (3): The structure of sports in Egypt

3. Geographical distribution of team sports activities in youth centers in Egypt:

The group of team games in Egypt includes six games: football, handball, basketball, volleyball, tennis, and Ping pong. The following table shows the geographical distribution of team games in the Egyptian governorates.

Table (3)
Distribution of players according to sports in youth centers in Egypt in 2022

Governorate	Team games						
	football	handball	Basketball	Volleyball	Tennis	Ping pong	Total
Cairo	7531	536	1144	606	116	1062	10995
Alexandria	2981	314	757	265	40	250	4607
Port-Said	650	2090	144	45	0	98	3027
Suez	309	139	47	163	62	608	1328
Damietta	13561	130	82	1158	142	2150	17223
Dakahliya	15330	0	345	675	0	1561	17911
Sharqeia	9675	501	260	215	50	410	11111
Kalyobiya	8082	2648	812	2022	0	3051	16615
Kafr El Shiekh	2980	0	0	0	0	0	2980
Al Gharbya	5870	0	0	1240	0	1573	8683
Monofiya	4420	160	40	180	12	580	5392
El Beheira	4364	635	290	0	0	495	5784
Ismailia	3650	250	100	161	6	761	4928
Giza	16000	1014	310	950	0	2022	20296
Bani Souwaif	4825	955	162	1405	25	1359	8731
Fayoum	3288	10	10	44	5	1236	4593
Menia	6127	2680	2608	2664	5	789	14873
Assiut	7910	642	17	1114	0	2208	11891
Sohag	22674	78	370	1054	0	1951	26127
Qena	2848	1474	156	391	0	1215	6084
Aswan	3016	2322	164	361	0	199	6062
Luxor	3388	190	70	215	12	1027	4902
The Red Sea	683	105	60	106	23	137	1114
New Valley	1496	124	100	490	25	620	2855
Matrouh	2790	60	0	60	0	165	3075
North Sinai	2476	1060	315	970	5	689	5515
South Sinai	528	0	0	138	0	174	840
Total	157452	18117	8363	16692	528	26390	227542

Source: Central Agency for Public Mobilization & Statistics (CAPMAS), 2022.

Table (3) and figure (4) show that the numbers of players in team games vary clearly in the Republic's governorates as follows:

Football: The number of its players in youth centers is about 157.4 thousand, distributed in varying proportions across all governorates. Sohag Governorate comes first, followed by Giza, and they both include about a quarter of the footballers in youth centers, and then come the governorates of Dakahlia, Damietta, Sharkia, Qalyubia, and Assiut which rank third to seventh. The seven governorates together comprise about 69.2% of football players in youth centers. The remaining governorates have about 30.8% of the football players in

youth centers. These governorates include major governorates such as Cairo and Alexandria. However, the governorates that have the least number are Suez, South Sinai, Port Said, the Red Sea, and New Valley, as any of them has less than 1% of the total football players in youth centers in Egypt.

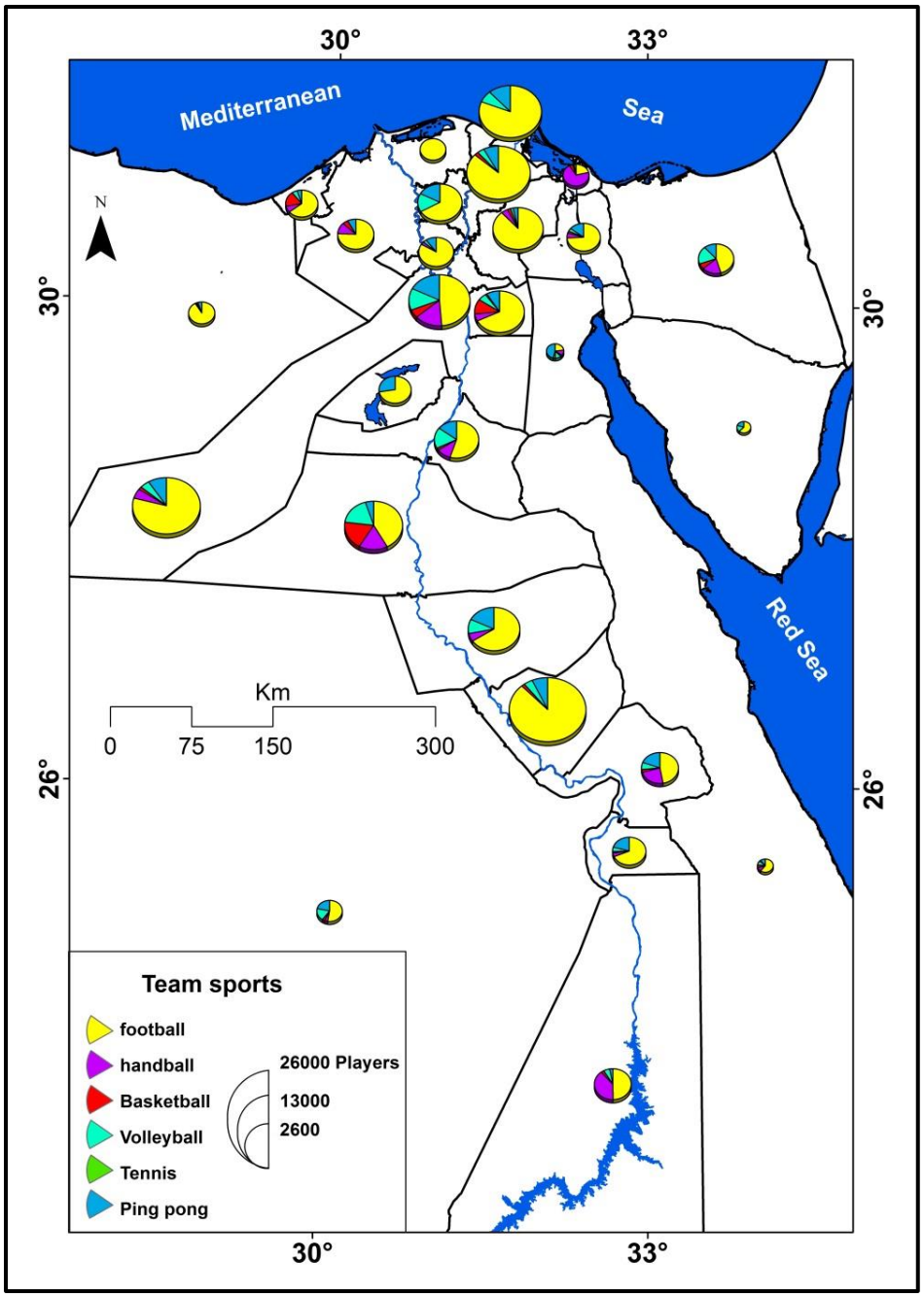

Fig. (4): Distribution of team games in Egypt's governorates

Ping pong: It is considered the most widespread game in the governorates' youth centers after football. It spreads across all governorates except Kafr el-Sheikh, and accounts for 11.6% of the team game players in Egyptian youth centers. The governorate of Qalyubiya ranks first in terms of the relative size of Ping pong players, followed by Assiut, and then the governorates of Giza, Damietta, and Sohag, where the five governorates together comprise 43.13% of Ping pong players in youth centers. In contrast, Port Said is considered the lowest in terms of the relative size of Ping pong players with a percentage of 0.37% of their total number at the level of Egyptian youth centers.

Handball: It ranks third in terms of the relative size of players in team games with a percentage of 7.9%, and it spreads in the youth centers of the Egyptian governorates except four governorates, i.e. Dakahlia, Kafr el-Sheikh, Gharbia, and South Sinai. Menia ranks first in terms of relative size of handball players, followed by Qalyubiya with a small relative difference. Aswan ranks third while Port Said ranks fourth. The four governorates include more than half of the handball players in Egypt's youth centers, while Fayoum ranks last in terms of the relative size of its handball players.

Volleyball: It ranks fourth in terms of the relative size of team games with a percentage of 7.33%, and it spreads across all governorates except Kafr el- Sheikh and Beheira. However, in terms of its relative size of players, it ranks third

among team games. Menia Governorate comes first, followed by Qalyubia. Together, the two governorates include more than a quarter of the volleyball players in Egyptian youth centers. The relative size varies between (5:10%) in seven governorates: Bani Souwaif, Gharbia, Damietta, Assiut, Sohag, Giza, and North Sinai, respectively. The remaining governorates include less than a quarter of volleyball players, with a relative size of less than 5% of the volleyball players in Egyptian youth centers.

Basketball: This game spreads in the youth centers of all governorates except four governorates: Kafr el-Sheikh, Gharbia, Matrouh, and South Sinai. The relative distribution of this game is concentrated as the governorates of Menia, Cairo, Qalyubia and Alexandria account for more than half of the basketball players in Egyptian youth centers, while the relative share of any of the other governorates is less than 5% of the basketball players in its youth centers and the relative share is the lowest in Fayoum.

Tennis: The number of players of this game in the Egyptian youth centers is 528, and this game is not localized in the youth centers of 13 governorates. The governorate of Damietta ranks first, followed by Cairo, and in the third rank comes Suez with 60.6% of its players.

4. Analysis of the spatial productivity of players at the level of team sports in Egypt:

Team games rank first in the gaming groups in Egypt, where they have 63.1% of the players of the youth centers. When comparing these players with the population (aged 10 -40 years) to calculate the average share of the player per 100,000 persons in the team sports, it is noticed that it reaches 464.7 players/100,000 persons. This can be seen from the following table:

Table (4)
Productivity rate of players - players/100,000 persons in Egypt in 2022

Governorate	Population (10-40 year)	productivity rate						
		football	handball	Basketball	Volleyball	Tennis	Ping pong	Total
Cairo	4952697	152.06	10.82	23.1	12.24	2.34	21.44	222
Alexandria	2985008	99.87	10.52	25.36	8.88	1.34	8.38	154.34
Port-Said	375989	172.88	555.87	38.3	11.97	0	26.06	805.08
Suez	373275	82.78	37.24	12.59	43.67	16.61	162.88	355.77
Damietta	623370	2175.43	20.85	13.15	185.76	22.78	344.9	2762.89
Dakahliya	3210617	477.48	0	10.75	21.02	0	48.62	557.87
Sharqeia	3642033	265.65	13.76	7.14	5.9	1.37	11.26	305.08
Kalyobiya	2959486	273.09	89.47	27.44	68.32	0	103.09	561.42
Kafr El Shiekh	2030600	146.75	0	0	0	0	0	146.75
Al Gharbya	2491120	235.64	0	0	49.78	0	63.14	348.56
Monofiya	2154664	205.14	7.43	1.86	8.35	0.56	26.92	250.25
El Beheira	3113768	140.15	20.39	9.31	0	0	15.9	185.76
Ismailia	654988	557.26	38.17	15.27	24.58	0.92	116.19	752.38
Giza	4475516	357.5	22.66	6.93	21.23	0	45.18	453.49
Bani Souwaif	1605669	300.5	59.48	10.09	87.5	1.56	84.64	543.76
Fayoum	1818966	180.76	0.55	0.55	2.42	0.27	67.95	252.51
Menia	2847123	215.2	94.13	91.6	93.57	0.18	27.71	522.39
Assiut	2296784	344.39	27.95	0.74	48.5	0	96.13	517.72
Sohag	2539549	892.84	3.07	14.57	41.5	0	76.82	1028.8
Qena	1633696	174.33	90.22	9.55	23.93	0	74.37	372.41
Aswan	759757	396.97	305.62	21.59	47.52	0	26.19	797.89
Luxor	648470	522.46	29.3	10.79	33.15	1.85	158.37	755.93
The Red Sea	155568	439.04	67.49	38.57	68.14	14.78	88.06	716.09
New Valley	120451	1242	102.95	83.02	406.8	20.76	514.73	2370.26
Matrouh	218706	1275.69	27.43	0	27.43	0	75.44	1406
North Sinai	223233	1109.16	474.84	141.11	434.52	2.24	308.65	2470.51
South Sinai	52769	1000.59	0	0	261.52	0	329.74	1591.84
Total	48963872	321.57	37	17.08	34.09	1.08	53.9	464.71

Source: Central Agency for Public Mobilization & Statistics (CAPMAS), 2022.

As can be seen observed from table (4) and figure (5), football has a unique place in the structure of the team games of the youth centers in Egypt, as it accounts for the largest percentage of players of these games, and is also characterized by a high average number of players per 100,000 persons. The average number of players per 100,000 inhabitants is 735.9 players; therefore, the governorates can be classified according to this average as follows:

- Governorates whose average exceeds the general average for youth centers, and these include six governorates: Damietta, Matrouh, New Valley, North and South Sinai, and Sohag, respectively.
- Governorates whose average ranges between the general average for youth centers and the average for the game. These include Ismailia, Luxor, Dakahlia, Red Sea, Aswan, and Giza.
- Governorates whose average is less than the sport average, and these include the rest of the governorates, where the average reaches its lowest value in Suez Governorate by 82.7 players/100,000 persons.

Ping pong is ranks second in terms of the relative share of players and it spreads in the youth centers of all governorates, with the exception of Kafr el-Sheikh. It attracts about 54 players out of every 100,000 persons. Thus, it ranks third in this indicator. The values of this average vary from one governorate to another, and it reaches its highest value in the youth centers of the New Valley, followed by Damietta, then the youth centers of South and North Sinai governorates whose values exceed 100 players/100,000 persons.

Handball ranks third with an average player productivity of 37 players/100,000 persons. Port Said and North Sinai are the governorates with the highest production of handball players, with an average of more than 450 players/100,000 persons. Cairo, Alexandria, Menoufia, Fayoum, and Sohag, on the other hand, have the lease handball player productivity, with an average of no more than 11 players/100,000 persons, while the governorates of Dakahlia, Kafr El-Sheikh, Gharbia, and South Sinai have no handball player productivity.

Volleyball ranks fourth among team games in terms of player productivity, with a general average of 34 players/100,000 persons. North Sinai, New Valley, and South Sinai are the most productive governorates, with player productivity of more than 400 players per 100,000 persons in the first and second governorates, and 200 players in the third.

Basketball ranks fifth, with an average productivity of 17 players per 10,000 persons. The average player productivity ranges from 141 players in North Sinai to at least two players in the governorates of Menoufia and Fayoum, while no player productivity was recorded in the governorates of Kafr el-Sheikh, Gharbia, Matrouh and South Sinai. Tennis ranks last, with a general average not exceeding 1.08 players/100,000 persons.

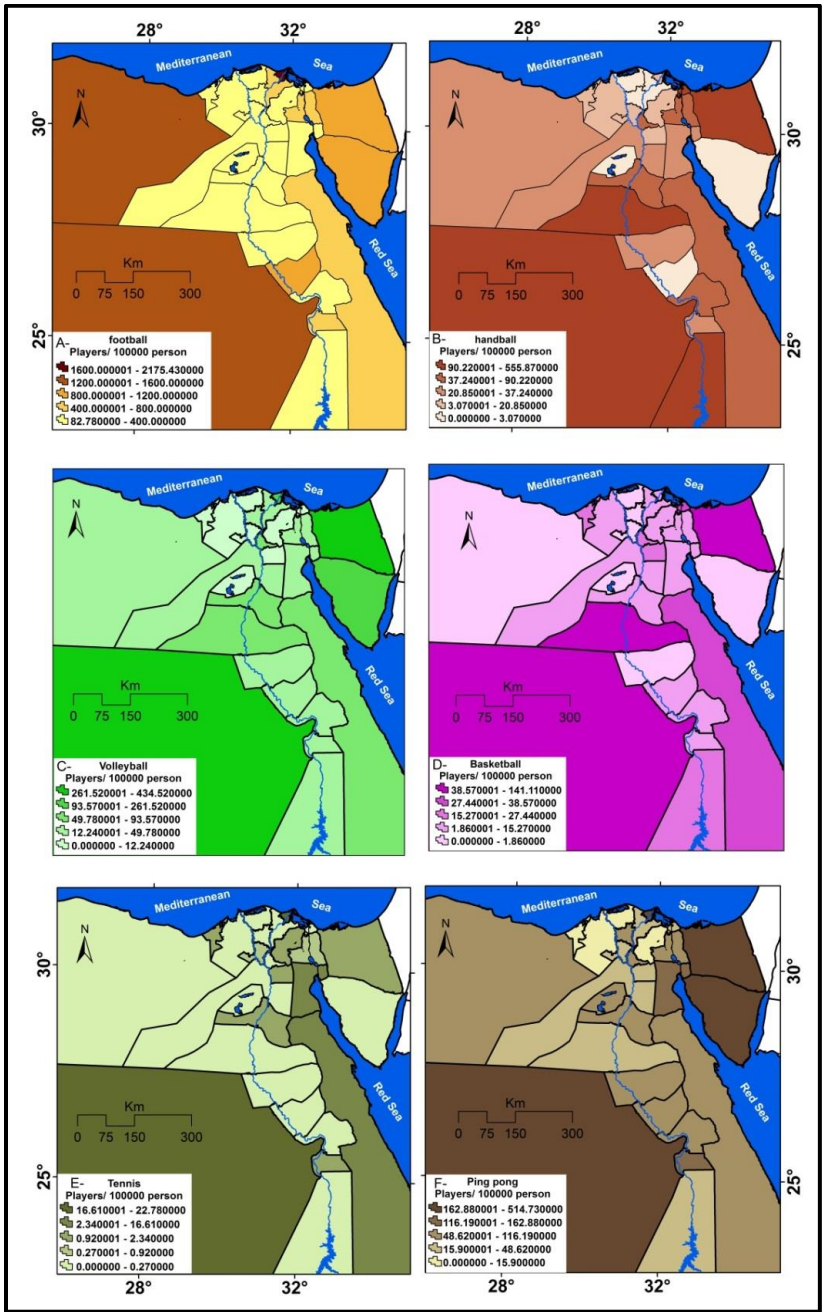

Fig. (5): Population productivity rate of players in Egypt in 2022

5. Analysis of the results of spatial modeling of players' production regionals at the level of team sports in Egypt:

Team games constitute the largest relative weight of the number of players in the youth centers, and can be classified spatially into three categories. The first category includes the main governorates in the team sports with a relative size exceeding 5% of the players in the team games, primarily Sohag governorate, followed by Giza, Dakahlia, Damietta, and Qalyubiya while the governorates of Menia and Assiut rank last in this category. This category includes more than half of the players of the team games in youth centers.

The second category involves 17 governorates with a relative size of 1:5% of the players of team sports in the youth centers in Egypt. Cairo Governorate ranks first in this category while the New Valley Governorate ranks last. The third category includes three governorates: Suez, Red Sea, South Sinai, and the three governorates comprise only 1.44% of the players of team sports in Egyptian youth centers. It is noteworthy that football is the only team game that is prevalent in all the youth centers in the governorates compared to other games, and may even be the only team game that exists in some youth centers as is the case in Kafr el-Sheikh's youth centers. By reviewing the data in table (3), as well as table (5) and modeling its data, the regions of sports activity for team sports in Egypt can be identified. The following is a detailed explanation of the regions of these sports:

Football: The governorates of Sohag, Giza, Dakahlia, Damietta, Orientale, Qalyubiya and Assiut are considered a main football region in Egyptian youth centers. Together, they include about 69.2% of the football players in youth centers. The governorates can be classified according to the relative distribution of footballers in their youth centers into three categories. The first category includes the governorates with more than 5% of footballers in youth centers. This category includes seven governorates: Sohag, Giza, Dakahlia, Damietta, Sharkia, Qalyubiya and Assiut, respectively, and these governorates have more than half of these players. The relative importance coefficient is more than (1), which indicates the increasing relative importance of football in the youth centers in these governorates compared to its relative importance in all youth centers in Egypt. The second category includes the governorates with a relative share of 1:5% of football players in youth centers. This category includes 13 governorates and is the largest in terms of the number of governorates, as well as in terms of number population, as it includes the governorates with a large population

weight such as Cairo, Alexandria and Giza. The third category includes the governorates with a relative share of less than 1% of football players in youth centers in Egypt. This category includes five governorates that account for the largest share of the area of Egypt, but do not represent a population weight such as the governorates of the New Valley, the Red Sea, South Sinai, as well as the governorates of Suez and Port Said. When calculating the relative importance coefficient of the relative distribution of footballers and the total players of youth centers, the coefficient achieved more than (1) in 12 governorates: Damietta, Dakahlia, Sharkia, Kafr el-Sheikh, Beheira, Giza, Fayoum, Assiut, Sohag, Aswan, Luxor, and Matrouh. This indicates that the relative importance of football in these governorates is higher than that of the total level of youth centers in Egypt.

Handball: The region of this game is concentrated in four governorates: Menia, Qalyubiya, Aswan, and Port Said, which together account for more than half of the handball players in Egyptian youth centers. Calculating the relative importance coefficient, the coefficient values achieved more than (1) in 10 governorates, where it doubles, and consequently its relative importance in the governorates of Port Said, Luxor, Aswan, Qena, South Sinai, Menia, while in the other 10 governorates, which include: Suez, Ismailia, Bani Souwaif, Red Sea, the relative importance of handball is equivalent to that of the total games in Egyptian youth centers.

Volleyball: The governorates of Menia, Qalyubiya, Bani Souwaif, Gharbia, Damietta, Assiut, Sohag, Giza, and North Sinai can be regarded as the main region of this game as the nine governorates collectively account for three quarters of the volleyball players of the Egyptian youth centers. The relative importance coefficient was valued at more than (1) in 12 governorates, while it was valued at more than (2) in five governorates; namely, the New Valley, North and South Sinai, Menia, and Bani Souwaif. This means that the relative importance of volleyball in the centers of these governorates is more than twice its relative importance in all Egyptian youth centers. However, in the other seven governorates, the coefficient values range between (1:2) and these include Assiut, Gharbia, Port Said, Qalyubiya, Damietta, the Red Sea and Luxor.

Table (5)

Estimating standard scores for player distribution and productivity in Egypt in 2022

Governorate	Team games						
	football	handball	Basketball	Volleyball	Tennis	Ping pong	Total
Cairo	0.32	0.2	0.44	0.23	0.82	0.35	0.4
Alexandria	0.12	0.12	0.29	0.1	0.28	0.08	0.15
Port-Said	0.02	0.78	0.06	0.02	0	0.03	0.09
Suez	0	0.05	0.02	0.06	0.44	0.2	0.02
Damietta	0.59	0.05	0.03	0.43	1	0.7	0.65
Dakahliya	0.67	0	0.13	0.25	0	0.51	0.68
Sharqeia	0.42	0.19	0.1	0.08	0.35	0.13	0.41
Kalyobiya	0.35	0.99	0.31	0.76	0	1	0.62
Kafr El Shiekh	0.12	0	0	0	0	0	0.08
Al Gharbya	0.25	0	0	0.47	0	0.52	0.31
Monofiya	0.18	0.06	0.02	0.07	0.08	0.19	0.18
El Beheira	0.18	0.24	0.11	0	0	0.16	0.2
Ismailia	0.15	0.09	0.04	0.06	0.04	0.25	0.16
Giza	0.7	0.38	0.12	0.36	0	0.66	0.77
Bani Souwaif	0.2	0.36	0.06	0.53	0.18	0.45	0.31
Fayoum	0.13	0	0	0.02	0.04	0.41	0.15
Menia	0.26	1	1	1	0.04	0.26	0.55
Assiut	0.34	0.24	0.01	0.42	0	0.72	0.44
Sohag	1	0.03	0.14	0.4	0	0.64	1
Qena	0.11	0.55	0.06	0.15	0	0.4	0.21
Aswan	0.12	0.87	0.06	0.14	0	0.07	0.21
Luxor	0.14	0.07	0.03	0.08	0.08	0.34	0.16
The Red Sea	0.02	0.04	0.02	0.04	0.16	0.04	0.01
New Valley	0.05	0.05	0.04	0.18	0.18	0.2	0.08
Matrouh	0.11	0.02	0	0.02	0	0.05	0.09
North Sinai	0.1	0.4	0.12	0.36	0.04	0.23	0.18
South Sinai	0.01	0	0	0.05	0	0.06	0
Total	157452	18117	8363	16692	528	26390	227542
Standard scores							
Governorate	football	handball	Basketball	Volleyball	Tennis	Ping pong	Total
Cairo	0.32	0.2	0.44	0.23	0.82	0.35	0.4
Alexandria	0.12	0.12	0.29	0.1	0.28	0.08	0.15
Port-Said	0.02	0.78	0.06	0.02	0	0.03	0.09
Suez	0	0.05	0.02	0.06	0.44	0.2	0.02
Damietta	0.59	0.05	0.03	0.43	1	0.7	0.65
Dakahliya	0.67	0	0.13	0.25	0	0.51	0.68
Sharqeia	0.42	0.19	0.1	0.08	0.35	0.13	0.41
Kalyobiya	0.35	0.99	0.31	0.76	0	1	0.62
Kafr El Shiekh	0.12	0	0	0	0	0	0.08
Al Gharbya	0.25	0	0	0.47	0	0.52	0.31
Monofiya	0.18	0.06	0.02	0.07	0.08	0.19	0.18
El Beheira	0.18	0.24	0.11	0	0	0.16	0.2
Ismailia	0.15	0.09	0.04	0.06	0.04	0.25	0.16
Giza	0.7	0.38	0.12	0.36	0	0.66	0.77
Bani Souwaif	0.2	0.36	0.06	0.53	0.18	0.45	0.31
Fayoum	0.13	0	0	0.02	0.04	0.41	0.15
Menia	0.26	1	1	1	0.04	0.26	0.55
Assiut	0.34	0.24	0.01	0.42	0	0.72	0.44
Sohag	1	0.03	0.14	0.4	0	0.64	1
Qena	0.11	0.55	0.06	0.15	0	0.4	0.21
Aswan	0.12	0.87	0.06	0.14	0	0.07	0.21
Luxor	0.14	0.07	0.03	0.08	0.08	0.34	0.16
The Red Sea	0.02	0.04	0.02	0.04	0.16	0.04	0.01
New Valley	0.05	0.05	0.04	0.18	0.18	0.2	0.08
Matrouh	0.11	0.02	0	0.02	0	0.05	0.09
North Sinai	0.1	0.4	0.12	0.36	0.04	0.23	0.18
South Sinai	0.01	0	0	0.05	0	0.06	0

Source: Central Agency for Public Mobilization & Statistics (CAPMAS), 2022

Basketball: The main region of this game is in four governorates: Kafr el-Sheikh, Gharbia, Matrouh, and South Sinai. The four governorates together have more than half of the basketball players of Egyptian youth centers. The relative importance coefficient is more than (1) in 10 governorates. The coefficient recorded its highest value in Menia. The value indicates that the relative importance of this game in its youth centers is more than four times its relative importance in all Egyptian youth centers. It is followed by Alexandria, then Cairo in terms of the value of the relative importance of this game.

Ping pong: The main region of this game is concentrated in the youth centers of five governorates: Qalyubiya, Assiut, Giza, Damietta and Sohag. Together, these governorates include 43.13% of the number of Ping pong players in Egyptian youth centers.

Tennis: The governorates of Damietta, Cairo and Suez constitute the main region of this game, with 60.6% of its players.

Based on the modeling of the regionalization coefficient, the relative importance of games, the standard score of player productivity and the standard score of player numbers, figure (6), representing the general division of the regions of team games in Egypt, was produced.

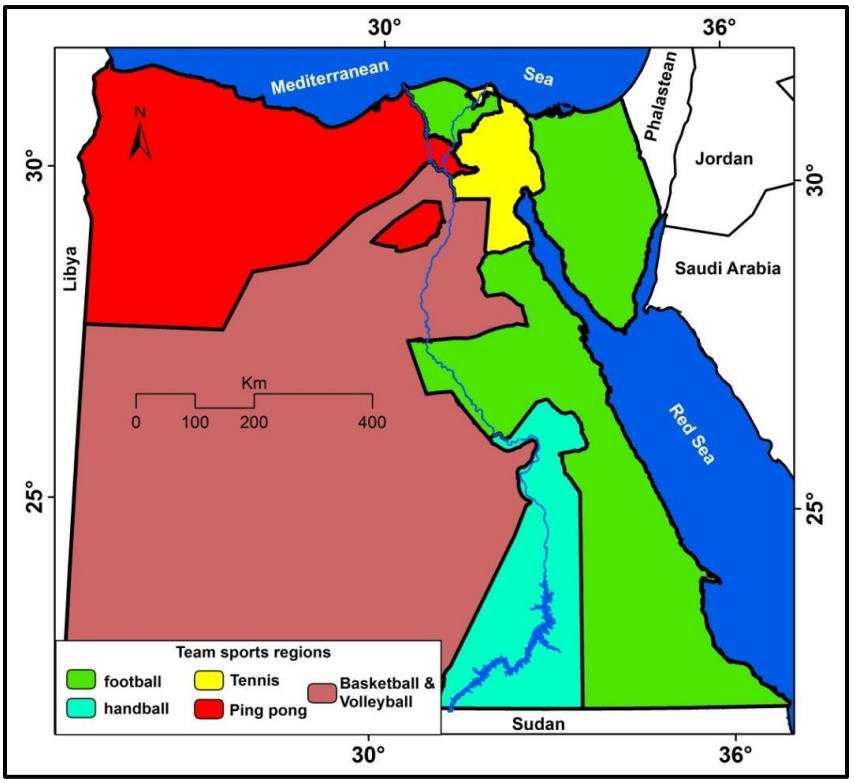

Fig. (6): Results of spatial regionalization of team games in Egypt

Conclusion and recommendations:

The study of the sports industry, player production regions, and the spatial analysis of the practice of sports activity for mass games in Egypt is considered a geospatial regionalization of these games. The study recommends the implementation of an effective strategy by the Egyptian Ministry of Youth and Sports to draw on the results of the geographical regionalization to discover sports talents in various team games to participate in international sports events, and to win championships in major sports competitions.

The study also recommends that more attention be paid to promoting specific sports regions, which will help to develop the pattern of sports tourism. Attention should also be paid to the regionalization of youth centers allocated for practicing team sports activities, and their development within each region through the provision of appropriate stadiums and the use of highly competent training cadres in different team games. In addition, the study recommends establishing a digital database of Egyptian youth centers, which allows the relevant agencies to easily access players' data and seek their opinions regarding the ways for developing the games they practice in these centers.

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التحليل الجغرافي للألعاب الجماعية كاستراتيجية لتنمية أقاليم صناعة الرياضة في مصر باستخدام نظم المعلومات الجغرافية

أ.م.د/ خالد إبراهيم محمد بدرة[١] أ.م.د/ محمد أحمد علي سليمان[٢]

أ.م.د/ أحمد علي أحمد علي[٣]

الملخص

خلفية عامة: يُعد النشاط الرياضي شكلاً من أشكال التعبير والتنظيم البشري، وتمثل الرياضة جزءًا مهمًا من الحياة اليومية، كما أنها أصبحت صناعة عالمية سريعة النمو. ونظراً لكون الأنشطة الرياضية ذات أبعاد مكانية؛ فقد اكتسبت الرياضة الشرعية العلمية في مجال الجغرافيا؛ بسبب قدرة الجغرافيا في فهم أفضل للمشكلات الرياضية من خلال التحليل المكاني لها.

المشكلة: من منطلق أن الرياضة تعد أنشطة مكانية, وارتباط الجغرافيا والأنشطة الرياضية بعلاقة وثيقة, واعترافاً بالدور الحيوي الذي تلعبه الجغرافيا في اختلاف الأنماط المكانية للألعاب التي تُمارس حسب البيئات الجغرافية المتنوعة, لذا فإن المشكلة البحثية ركزت على التحليل المعمق لأقاليم الأنشطة الرياضية للألعاب الجماعية بمراكز الشباب في مصر.

الأهداف: تحديد نمط التوزيع المكاني لمراكز الشباب، وإبراز الأهمية النسبية للألعاب الجماعية في بنية النشاط الرياضي المصري, والتحليل الإقليمي للأنماط التوزيعية للأنشطة الرياضية الجماعية, وصولاً لأقلمة جيومكانية لخريطة إنتاج اللاعبين بمراكز الشباب الرياضية في مصر, وفتح مجال للوقوف على تأثير الاختلافات المكانية في الألعاب الرياضية، وإبراز دور المكان كعنصر فعال في النشاط الرياضي الذي يُمارس في بيئات جغرافية متنوعة.

المنهجية: إضافة إلى منهج التحليل المكاني اعتمدت الدراسة على الأساليب الإحصائية المكانية, واستعانت بتقنيات نظم المعلومات الجغرافية في بناء نماذج لنمذجة الأنشطة الرياضية الجماعية، لاستنتاج وتحديد الأقاليم الجغرافية لهذه الأنشطة.

(١) قسم الجغرافيا ونظم المعلومات الجغرافية, كلية الآداب, جامعة أسيوط.

(٢) قسم الجغرافيا, معهد البحوث والدراسات الأفريقية ودول حوض النيل، جامعة أسوان.

(٣) قسم الجغرافيا ونظم المعلومات الجغرافية, كلية الآداب, جامعة أسيوط.

النتائج: قدمت الدراسة تحليلًا مكانيًا لممارسة النشاط الرياضي الجماعي في مصر, وخريطة لإنتاجية اللاعبين بمراكز الشباب في مصر, وأقلمة جغرافية مكانية للألعاب الرياضية الجماعية. وأكدت على أن المظلة العريضة للجغرافيا قد أنتجت تنوعًا في الأنشطة الرياضية التي تُمارس في مصر, ويمكن الاعتماد علي نتائج الأقلمة الجغرافية لاستكشاف المواهب الرياضية لتشارك في المحافل الرياضية الدولية, وتنمية صناعة الرياضة في مصر.

الكلمات المفتاحية: صناعة الرياضة, الأقلمة المكانية, الألعاب الجماعية، إنتاجية اللاعبين, مصر.