Original Article

Society affluence vs sport development in Poland

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Abstract:

In this article, we try to answer the question whether there is a correlation between the affluence of the society and the development of sport in Polish regions. Due to the lack of other data, we focused on institutionalized sport connected with sports clubs and Polish sports associations. We studied voivodeships (NUTS 2) in the period 2012-2018. The affluence of the society was represented by the average monthly available income per capita. Due to the multidimensional nature of sport, we have constructed a synthetic variable (composite indicator) for its description. We used 10 indicators regarding 4 groups of people (4 dimensions): participants, staff, women and the young (youth and children). We have normalized the indicators using anti-pattern normalization. The arithmetic mean was used to aggregate the indicators inside the dimensions, while the geometric mean combined the dimensions. Such aggregation method can be conveniently used for cyclical research. However, to control the results, we also used scaling (or max-min normalization, unitarization), which is the most popular method in dynamic studies. Statistical analysis did not show a significant correlation between the affluence and the development of sport in general, neither between affluence and any of the dimensions of sport development considered. However, we noticed an interesting regularity. During the study period, the direction of the relationship between the analyzed phenomena changed. In 2012 there was a weak negative correlation, which consistently evolved to achieve a weak positive result in 2018. This regularity was present both in sport in general and in each dimension. We should emphasize that the results obtained using both normalizations were similar.

Key Words: composite indicator of sport development, normalization, sports clubs, Polish sports associations

Introduction

There is a lot of evidence indicating a beneficial effect of physical activity on health (compare e.g. Brodáni, Spišiak, & Paška, 2015, De Souza, De Carvalho & Ferreira, 2018, Gaetano, 2016, Piotrowska & Pabianek, 2019). Therefore, in affluent societies that struggle with health issues that are in some ways related to well-being (obesity, diabetes, hypertension, etc.), physical activity is promoted as one of the elements of a "healthy lifestyle". Also in Poland, broadly understood physical culture enjoys increasing social interest. And because, at the same time, prosperity in Poland has significantly improved in the last 30 years, the question arises whether there is a relationship between the development of sport and the affluence of the society. However, the answer to this question is not obvious. On the one hand, research shows (Metelski, 2019) that the richer a household is, the more physically active its members are. On the other hand, Central Statistical Office research (CSO, 2009, 2013a, 2017a) shows that only for a small group of Poles (4.6% in 2016) finance is the main barrier to do sports. Moreover, some studies from other countries show that regions with low socio-economic status can present high sport participation (Kozma, Bács & Perényi, 2015).

Due to the unavailability of other types of data, we focused on institutionalized sport related to sports clubs and Polish sports associations. The collected data enabled us to carry out an analysis of every two years starting from 2012. We studied sport in the regions, because according to the Act of June 25, 2010, local governments have the obligation to create conditions conducive to the development of sport. We examined NUTS 2 territorial units (voivodeships) because they are diverse in terms of affluence, and at the same time the data regarding clubs and sports associations are cyclically collected for these units. Studies show (Kościółek, 2019) that sports clubs largely support themselves from local subsidies. It was therefore expected that the richer the region is, the more its institutionalized sport should develop. The development of sport can be assessed on the basis of many different indicators, because it is a multidimensional phenomenon. The Ministry of Sport and Tourism listed 40 such indicators in the Sport Development Program until 2020 (MST, 2015). The document presents the strategy of sport development, and the mentioned indicators are used to monitor this strategy. The indicators have specific goals that should be met by 2020. In our research, we selected only 10 indicators of sport development that sufficiently differentiated the voivodeships. We did not analyze each indicator separately, but we constructed a synthetic variable (composite indicator) that comprehensively characterized the development of sport in the regions and then we could study its relationship with affluence. We used the average monthly available income per capita in private households to assess affluence. The Central Statistical Office (CSO) also

used the synthetic approach in the analysis of the development of sports in Poland (CSO, 2019). However, the CSO survey differs significantly from ours because it focuses mainly on sports infrastructure (5 out of 7 indicators used relate to sports facilities). In our study, we did not consider sports infrastructure at all, because its condition is largely influenced by the affluence of regions. The difference between our study and the CSO study also applies to the method of variables synthesizing. In this article, the method had to be different, because the essence of our study was to observe changes over time, while the CSO survey was an individual study. We used the method presented in Müller-Frączek, 2019a. It is inspired by the construction of the Human Development Index, but it uses a different type of normalization, namely an *anti-pattern normalization*. From the point of view of our analyzes, the advantage of this method is its adaptation to cyclical research. After the appearance of data for the next period, we will be able to repeat the study, and the results obtained will be comparable with the previous ones. An additional benefit results from two-stage aggregation. We divided the indicators into 4 groups (the so-called *dimensions*) that characterize various aspects of sport development. First, we aggregated the indicators inside the dimensions, in the next step we combined the dimensions. In this way we received not only a synthetic variable of sport development, but also synthetic variables of its various aspects.

Material & methods

The low availability of data limited the scope of the study both in terms of time and overall approach to sport. We used the data from reports of sports clubs submitted every two years and annual reports of Polish sports associations. The Central Statistical Office collects and publishes this data (CSO, 2013b, 2015, 2017b, 2019). We have set indicators that characterize the development of sport and at the same time sufficiently differentiate the voivodeships, i.e. they have coefficients of variation above 10% in all years of the analysis. From the considered indicators, we chose those that concerned people. All of them were stimulants. We have obtained the uniform data for the years 2012, 2014, 2016 and 2018.

We divided the indicators into 4 parts (dimensions) that characterize various groups of people associated with sport: participants, staff, women and the young (youth and children). Within dimensions, we have removed strongly linearly correlated indicators. We present in Table 1 the final set of indicators.

Table 1 Indicators of sport development

Dimension	Symbol and description
Participants	x_1 Persons practising sports in sports clubs per 100 inhabitants
	x_2 Competitors registered in Polish sports associations per 100 inhabitants
Staff	x_3 Sports judges per 1000 inhabitants
	x_4 Sports judges with international class per 100 sports judges
	x_5 Members of coaching staff in sports clubs per 1000 inhabitants
Women	x_6 Females practising sports in sports clubs per 1000 population
	x_7 Females practising sports in sports clubs per 10 persons practising sports in sports clubs
	x_8 Female competitors registered in Polish sports associations per 10 competitors
Young	x_9 Youth aged up to 18 practising sports in sports clubs per 10 persons aged up to 18
	x_{10} Juniors (no seniors) per 100 inhabitants

Table 2 presents the basic characteristics of the indicators. We can assume that, on average, institutional sport in Poland developed over the considered period. Most of the mean values of indicators increased from period to period (25 times for 30 items), the minimum values also usually increased (21 times for 30 items).

"Staff" developed the weakest, and among the indicators x_3 was the worst.

Table 2 Basic characteristics of sport development indicators

Characteristic	Year	Participants		Staff			Women			Young	
		x_1	x_2	x_3	x_4	x_5	x_6	x_7	x_8	x_9	x_{10}
Mean	2012	2.38	2.37	1.18	3.35	1.31	5.77	2.45	1.12	0.91	1.29
	2014	2.39	3.11	1.23	3.35	1.30	5.90	2.49	1.27	0.93	1.85
	2016	2.68	3.33	1.21	3.64	1.43	6.62	2.49	1.05	1.07	1.83
	2018	2.73	3.84	1.06	3.75	1.46	6.89	2.54	1.06	1.08	2.05
Standard deviation	2012	0.43	0.62	0.21	1.01	0.22	1.03	0.32	0.26	0.14	0.26
	2014	0.42	0.75	0.16	1.01	0.22	0.90	0.31	0.25	0.13	0.35
	2016	0.43	0.73	0.19	0.98	0.23	0.89	0.27	0.20	0.15	0.31
	2018	0.39	0.71	0.15	1.02	0.23	0.94	0.28	0.21	0.13	0.27
Minimum	2012	1.67	1.28	0.88	1.49	0.94	4.12	1.69	0.72	0.64	0.71
	2014	1.63	1.77	0.96	1.44	0.87	4.01	1.74	0.91	0.67	1.09
	2016	1.84	1.94	0.90	1.72	0.95	4.66	1.79	0.71	0.80	1.16
	2018	1.85	2.49	0.81	2.15	0.93	4.21	1.97	0.73	0.80	1.53
Maximum	2012	3.39	4.04	1.60	5.57	1.82	7.93	3.04	1.73	1.18	1.90
	2014	3.37	5.06	1.52	5.91	1.76	7.68	3.05	1.97	1.23	2.64
	2016	3.64	5.00	1.61	5.58	1.93	8.16	2.91	1.49	1.35	2.30
	2018	3.59	5.40	1.32	5.76	1.90	8.03	3.07	1.60	1.36	2.52

Institutionalized sport in Poland developed, but the situation in voivodeships varied, which is particularly evident in the rankings created on the basis of individual indicators. The concordance of these rankings was low, Kendall's W coefficients for subsequent years were equal to: 0.24, 0.24, 0.29 and 0.27 respectively. In this situation, studying the relationship between the affluence of society and individual indicators would be inefficient. Conclusions based on different indicators could be different. That is why the synthetic approach seems to be more correct, it combines into a single variable various aspects of the same multidimensional phenomenon. We used this approach in the article. Research using synthetic variables are quite popular. For example Bandura (2011) identifies over 400 official composite indicators. While Greco et al. (2019) present the results of searching for 'composite indices' in SCOPUS, conducted in January 2017. They write 'The increase over the past 20 years is exponential, and the number of yearly publications shows no sign of a decline.' Examples of sport synthetic variables can be found e.g. in De Bosscher, 2018. Basic rules and methods of synthetic variable construction can be found e.g. in Casadio Tarabusi & Guarini, 2013. The first stage is bringing indicators to comparability, i.e. normalization. We start the anti-pattern normalization by determining the least favorable observations (so-called *anti-patterns*), in the case of stimulants these are minimum values. We then calculate the distances of other observations from anti-patterns for each variable and each time period:

$$d_{ijt} = x_{ijt} - \min_i x_{ijt}, \quad \text{where } i = 1, \dots, 16 \text{ numbers voivodeships, } j = 1, \dots, 10 \text{ numbers indicators, and } t = 1, \dots, 4 \text{ numbers years of analysis.}$$
 Then, the normalized value of the indicator is:

$$u_{ijt} = \frac{d_{ijt}}{\sum_{k=1}^{16} d_{kjt}}.$$

Although the calculations are based solely on current data, the normalized indicators are comparable over time. Unlike the commonly used methods of dynamic normalization, this method can be conveniently used for cyclical research, because new observations do not affect previously normalized indicators. The cost is the relativity of the results. An increase in the normalized value of the indicator over time for a given voivodeship does not have to mean an increase in the actual value of this indicator, but only an improvement in the result of the voivodeship compared to other voivodeships. For example, if the values for all voivodeships decrease, the voivodeship with the lowest fall will have the highest value after normalization. Other properties of anti-pattern normalization are similar to the original, i.e. *pattern normalization*, and can be found in Müller-Frączek, 2019b.

The aggregation of the normalized indicators is the next stage in the construction of a synthetic variable. We chose an aggregation in which synthetic variables for dimensions are constructed first. In this way, we can analyze not only the development of sport in general, but also the development of its various aspects. The indicators inside the dimensions are aggregated using the arithmetic mean, and then the dimensions are combined using the geometric mean. Table 3 shows the exact formulas. Such method of constructing a synthetic variable was previously used in Müller-Frączek, 2019a.

Table 3 Formulas for synthetic variables of sport development in dimensions and in general

Dimension	Symbol and formula
Participants	$P_{it} = (u_{i1t} + u_{i2t})/2$
Staff	$S_{it} = (u_{i3t} + u_{i4t} + u_{i5t})/3$
Women	$W_{it} = (u_{i6t} + u_{i7t} + u_{i8t})/3$
Young	$Y_{it} = (u_{i9t} + u_{i10t})/2$
General	$G_{it} = \sqrt[4]{P_{it} \cdot S_{it} \cdot W_{it} \cdot Y_{it}}$

We used average monthly available income per capita (Table 4) to describe the affluence of the society in Polish regions. In the analyzed period, this indicator improved both in Poland and in each of the voivodeships.

Table 4 Average monthly available income per capita (year 2012 was calculation basis)

Voivodeship (NUTS2)	2012		2014		2016		2018	
Dolnośląskie	1 367.00	2	1 354.14	4	1 595.73	2	1 704.34	3
Kujawsko-pomorskie	1 133.97	12	1 190.82	14	1 316.64	13	1 564.37	10
Lubelskie	1 056.45	15	1 197.57	13	1 307.09	15	1 483.17	15
Lubuskie	1 231.16	9	1 273.90	7	1 507.69	5	1 616.37	6
Łódzkie	1 268.42	6	1 281.82	6	1 467.15	7	1 573.27	9
Małopolskie	1 189.84	10	1 249.34	9	1 432.17	8	1 580.41	8
Mazowieckie	1 710.01	1	1 688.42	1	1 791.77	1	1 972.38	1
Opolskie	1 294.26	4	1 233.59	11	1 398.42	11	1 542.98	12
Podkarpackie	959.12	16	1 043.63	16	1 141.04	16	1 308.00	16
Podlaskie	1 242.39	8	1 247.39	10	1 428.52	9	1 550.22	11
Pomorskie	1 350.56	3	1 364.06	3	1 569.90	3	1 686.90	4
Śląskie	1 278.87	5	1 369.36	2	1 522.49	4	1 705.82	2
Świętokrzyskie	1 119.76	13	1 189.04	15	1 313.95	14	1 504.65	14
Warmińsko-mazurskie	1 109.95	14	1 218.77	12	1 380.18	12	1 509.50	13
Wielkopolskie	1 153.43	11	1 257.46	8	1 408.55	10	1 582.48	7
Zachodniopomorskie	1 263.56	7	1 353.22	5	1 491.97	6	1 672.04	5
Poland	1 278.43		1 328.48		1 483.58		1 644.11	

Results

Table 5 presents the synthetic results, both variable values and their corresponding rankings.

Table 5 Synthetic variables of sport development (values and ranks)

Voivodeship (NUTS2)	Participants		Staff		Women		Young		General	
Year 2012										
Dolnośląskie	0.076	6	0.086	3	0.028	14	0.066	7	0.059	7
Kujawsko-pomorskie	0.062	7	0.062	9	0.088	2	0.074	5	0.071	4
Lubelskie	0.043	11	0.050	11	0.074	5	0.051	10	0.053	10
Lubuskie	0.088	4	0.081	4	0.042	13	0.074	6	0.068	5
Łódzkie	0.038	13	0.034	14	0.065	9	0.048	11	0.045	14
Małopolskie	0.104	3	0.077	5	0.069	6	0.104	2	0.087	2
Mazowieckie	0.032	14	0.055	10	0.082	3	0.039	14	0.049	12
Opolskie	0.129	1	0.096	2	0.008	16	0.107	1	0.057	8
Podkarpackie	0.116	2	0.104	1	0.075	4	0.095	3	0.096	1
Podlaskie	0.028	15	0.064	8	0.126	1	0.040	13	0.055	9
Pomorskie	0.040	12	0.031	15	0.068	7	0.037	15	0.042	15
Śląskie	0.047	9	0.048	12	0.063	10	0.056	8	0.053	11
Świętokrzyskie	0.015	16	0.020	16	0.024	15	0.027	16	0.021	16
Warmińsko-mazurskie	0.044	10	0.047	13	0.062	11	0.042	12	0.048	13
Wielkopolskie	0.056	8	0.074	6	0.066	8	0.053	9	0.062	6
Zachodniopomorskie	0.082	5	0.071	7	0.061	12	0.088	4	0.075	3
Year 2014										
Dolnośląskie	0.083	4	0.110	1	0.037	14	0.072	6	0.070	5
Kujawsko-pomorskie	0.062	7	0.064	7	0.082	2	0.070	7	0.069	6
Lubelskie	0.043	11	0.044	13	0.071	4	0.051	11	0.051	11
Lubuskie	0.083	5	0.090	3	0.052	13	0.076	5	0.074	3
Łódzkie	0.042	12	0.032	15	0.068	5	0.048	12	0.046	14
Małopolskie	0.096	3	0.070	5	0.055	12	0.090	3	0.076	2
Mazowieckie	0.035	14	0.054	11	0.080	3	0.038	13	0.049	12
Opolskie	0.122	1	0.087	4	0.008	16	0.101	2	0.055	10
Podkarpackie	0.117	2	0.108	2	0.060	11	0.108	1	0.095	1
Podlaskie	0.023	15	0.058	8	0.127	1	0.033	15	0.048	13
Pomorskie	0.038	13	0.036	14	0.067	7	0.036	14	0.043	15
Śląskie	0.051	10	0.055	10	0.067	6	0.060	8	0.058	8
Świętokrzyskie	0.013	16	0.025	16	0.028	15	0.018	16	0.020	16
Warmińsko-mazurskie	0.052	9	0.048	12	0.066	9	0.054	10	0.055	9
Wielkopolskie	0.057	8	0.065	6	0.067	8	0.056	9	0.061	7
Zachodniopomorskie	0.082	6	0.055	9	0.063	10	0.088	4	0.071	4
Year 2016										
Dolnośląskie	0.081	5	0.091	2	0.053	12	0.081	6	0.075	4
Kujawsko-pomorskie	0.063	7	0.076	6	0.092	2	0.075	8	0.076	3
Lubelskie	0.036	14	0.031	14	0.057	10	0.039	14	0.040	14
Lubuskie	0.096	3	0.083	5	0.042	14	0.091	4	0.075	5
Łódzkie	0.044	12	0.029	15	0.069	6	0.050	10	0.046	13
Małopolskie	0.089	4	0.085	3	0.060	9	0.099	2	0.082	2
Mazowieckie	0.039	13	0.058	9	0.086	3	0.043	11	0.054	10
Opolskie	0.121	1	0.084	4	0.014	16	0.104	1	0.063	8
Podkarpackie	0.108	2	0.112	1	0.051	13	0.098	3	0.088	1
Podlaskie	0.023	15	0.051	11	0.108	1	0.020	15	0.040	15
Pomorskie	0.045	11	0.043	13	0.065	7	0.041	13	0.048	12
Śląskie	0.059	8	0.070	7	0.074	4	0.075	7	0.069	6
Świętokrzyskie	0.011	16	0.020	16	0.038	15	0.008	16	0.016	16
Warmińsko-mazurskie	0.049	10	0.055	10	0.055	11	0.042	12	0.050	11
Wielkopolskie	0.058	9	0.061	8	0.071	5	0.053	9	0.061	9
Zachodniopomorskie	0.078	6	0.048	12	0.065	8	0.082	5	0.067	7
Year 2018										
Dolnośląskie	0.082	5	0.101	2	0.039	14	0.077	6	0.071	5
Kujawsko-pomorskie	0.059	9	0.053	10	0.091	2	0.067	8	0.066	6
Lubelskie	0.040	14	0.034	14	0.059	10	0.045	13	0.044	15
Lubuskie	0.093	3	0.081	4	0.051	12	0.089	3	0.076	3
Łódzkie	0.042	13	0.033	15	0.067	6	0.048	11	0.046	13
Małopolskie	0.090	4	0.096	3	0.053	11	0.105	1	0.083	1
Mazowieckie	0.048	11	0.067	7	0.090	3	0.045	12	0.060	9
Opolskie	0.113	1	0.079	5	0.017	16	0.084	4	0.060	10
Podkarpackie	0.106	2	0.105	1	0.039	13	0.099	2	0.081	2
Podlaskie	0.025	15	0.051	12	0.122	1	0.027	15	0.045	14
Pomorskie	0.050	10	0.052	11	0.077	4	0.050	10	0.056	11
Śląskie	0.060	8	0.074	6	0.067	7	0.084	5	0.071	4
Świętokrzyskie	0.009	16	0.018	16	0.029	15	0.002	16	0.009	16
Warmińsko-mazurskie	0.044	12	0.054	9	0.062	9	0.039	14	0.049	12
Wielkopolskie	0.064	7	0.058	8	0.070	5	0.065	9	0.064	8
Zachodniopomorskie	0.075	6	0.045	13	0.067	8	0.075	7	0.064	7

Świętokrzyskie obtained the worst synthetic results. It was on the last position both in its total value and in three out of four dimensions, in the fourth dimension it was the penultimate. Its general result was deteriorating throughout the examined period as well as diminishing results in first and fourth dimensions. Zachodniopomorskie and Podkarpackie also had decreasing synthetic results. Podkarpackie was initially a leader

in the rankings, but it fell to the second position in 2018. In this year Małopolskie was promoted from the second position to the lead. The voivodeships: Lubuskie, Łódzkie, Mazowieckie, Pomorskie and Śląskie systematically improved their result, while Śląskie also improved its position, starting from 11 to 4 in 2018. Śląskie was a record holder in terms of changing the position in the extreme years of the study (7 positions). Next in this respect were the Pomorskie (promotion by 5 positions) and Lubelskie (decrease by 5 positions).

The diversity of sport development in dimensions was large. For example, no voivodeship in the top five general classification had all the dimensions classified in the top five. Opolskie was very interesting, it was the best in the first dimension, among the top in the second and fourth dimensions, and definitely the weakest in its third dimension (women in sport). Interestingly, the third dimension was also definitely the weakest for the leaders of the general classification, i.e. Małopolskie and Podkarpackie voivodeships. In third dimension, Podlaskie was the leader throughout the entire study period, while it was one of the last in general classification.

To answer the question asked in the article, we examined the correlation between the available income in Polish regions and synthetic measures of sport development both for values (Pearson correlation coefficient, marked r) and rankings (Spearman's rank correlation coefficient, marked ρ). Table 6 presents the results for each year and for every aspect of sport development.

Table 6 Correlation between affluence and sport development (anti-pattern normalization)

Year	Participants		Staff		Women		Young		General	
	r	ρ	r	ρ	r	ρ	r	ρ	r	ρ
2012	-0.21	-0.09	-0.12	0.00	-0.03	-0.20	-0.22	-0.10	-0.30	-0.25
2014	-0.31	-0.17	-0.19	-0.07	0.15	0.16	-0.33	-0.14	-0.26	-0.10
2016	-0.15	0.04	-0.12	0.06	0.25	0.30	-0.08	0.11	-0.03	0.09
2018	-0.12	0.18	0.02	0.22	0.34	0.34	-0.06	0.21	0.12	0.37

We did not detect a strong correlation between the affluence of the society and the development of sport in any year of the analysis. We also have not found a strong correlation between the affluence and any aspect of sport development. However, it is interesting to note that the trend in the direction of correlation has changed. Initially, it was negative - the richer the region is, the less developed it is in terms of institutional sport, both in general and for each dimension. However, over time the strength of the correlation weakened, and then changed its direction to positive. Considering all the aspects analyzed, it can be stated that the positive correlation strengthened in the last years of the study.

Discussion

Many factors could have influenced the results from the previous section, including the synthetic variable construction method, and in particular the specific (relative) normalization of variables. To eliminate doubts about normalization, we repeated the study changing the normalization method. We chose *scaling* (or *max-min normalization*, *unitarization*), which is very popular in dynamic research:

$$s_{ijt} = \frac{x_{ijt} - \min_{i,t} x_{ijt}}{\max_{i,t} x_{ijt} - \min_{i,t} x_{ijt}},$$

where $i = 1, \dots, 16$, $j = 1, \dots, 10$, and $t = 1, \dots, 4$. In the formula above, the maximum and minimum are determined on the basis of all observations both in time and in space, so that after the normalization all the indicators are comparable. Such normalization, although very popular, is not convenient when conducting cyclical studies, because with the appearance of new observations, the results obtained earlier should be recalculated to obtain comparability again. Therefore, in this study, scaling was not a basic method and was only used to verify the results obtained with the anti-pattern normalization.

We did not give the values of synthetic variables after scaling, but only presented r and ρ statistics in Table 7. The results obtained after scaling were similar to those presented in the previous chapter. The correlation was not significant in any year of the analysis. However, just like for the pattern-normalization, there was a similar tendency, the correlation has evolved from negative to positive.

Table 7 Correlation between affluence and sport development (scaling)

Year	Participants		Staff		Women		Young		General	
	r	ρ	r	ρ	r	ρ	r	ρ	r	ρ
2012	-0.24	-0.11	-0.08	0.00	-0.06	-0.28	-0.25	-0.10	-0.32	-0.30
2014	-0.32	-0.16	-0.17	0.01	0.13	-0.04	-0.33	-0.14	-0.27	-0.12
2016	-0.16	0.02	-0.11	0.06	0.19	0.21	-0.09	0.11	-0.07	0.09
2018	-0.13	0.20	0.00	0.21	0.31	0.42	-0.10	0.13	0.06	0.30

To sum up, the research did not show a significant relationship between the affluence of the region and its sporting development. Of course, this does not mean that there is no such relationship, because many factors that we did not include in the study could affect such a result. First of all, we should emphasize that the constructed synthetic variable characterizes only institutionalized sport, omitting other types of physical activity. This fragmentary approach to sport could distort the results obtained. Unfortunately, the most accurate data collected in Poland regarding physical activity of the members of the household (CSO, 2009, 2013a, 2017a) do not include location. Therefore, we could not use this data to construct a synthetic variable. Furthermore, we also did not consider all aspects of wealth. Instead of limiting ourselves to available income, we could consider the overall

economic development of the regions, as in, for example, Pietrzak & Balcerzak, 2017. We have plans for such research. We also plan an analysis using other variable aggregation methods, without prior division into dimensions. The applicable methods can be found, for example, in Müller-Frączek, 2018, or Müller-Frączek & Muszyńska, 2016.

However, taking into account the trend of strengthening the positive correlation (visible especially for rankings), it is likely that the examined correlation will only become visible when the average affluence in Poland reaches a higher level over time. It seems even more important to repeat the studies and it is valuable to use a method that gives such an opportunity.

Conclusions

We analyzed the correlation between the affluence of the society and the development of sport in Polish regions. Due to the limited data, we focused on institutional sport. The indicators used characterized various groups of people associated with sports clubs and Polish sports associations. We conducted the analysis at the NUTS 2 level (voivodeships) in 2012, 2014, 2016 and 2018.

We used the average monthly available income in private households to describe affluence, while to reflect the development of sport we constructed a synthetic variable (a composite indicator) that combined its various aspects. In the construction, we used 10 indicators, which we classified into 4 dimensions depending on the group of people concerned: participants, staff, women and the young (youth and children). First, we built synthetic variables for dimensions, then we combined them to create a general sport development measure.

Descriptive statistics tools were used to study the relationship between available income and synthetic variables. We have not detected a significant correlation between affluence and the general development of sport in any of the years of the analysis, nor have we found a significant relationship between affluence and any of the dimensions. But it is interesting to note that the tendency has changed over the years, from the initial negative correlation, through the total lack of relationship, to the weak positive correlation. This regularity occurred for both sport in general and for dimensions. Moreover, it seems that the positive correlation has strengthened and perhaps in the future it will be true that the richer the region of Poland is, the more sport develops in it.

The method used for the construction of synthetic variables can be used for cyclical research. Therefore, the research described in the article will be repeated, which will allow us to verify the mentioned hypothesis.

Conflicts of interest - The author declares that there is no conflict of interest.

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