

# The Relationship Between the Economic Development Levels of the Countries and Their Sporting Achievements in the 2020 Tokyo Olympics

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Received: November 5, 2021 Accepted: November 30, 2021

Published: December 31, 2021

doi:10.5296/jei.v7i3.19265

URL: <https://doi.org/10.5296/jei.v7i3.19265>

## Abstract

The purpose of this study is to investigate the relationship between the economic development and order of success of the countries ranked in the top 20 at the 2020 Tokyo Olympics. In this context, the total number of medals of the countries in the top 20 of the total number of medals in the Tokyo 2020 Olympics was selected as a sporting success, as an indicator of development, the countries' Gross Domestic Product (GDP) levels were also considered.

In order to investigate the relationship between sporting success and economic development; SPSS package program was used. The significance level was considered as  $p < 0.05$ . Correlation analysis was performed by selecting the total number of medals as a dependent variable, the gross domestic products as an independent variable, and the population as a control variable.

Findings of this research, a relationship was found the Gross Domestic Product (GDP) of the countries and the number of medals obtained at the 2020 Tokyo Olympics.

According to these findings, a relationship has been found between economic development of countries and the number of medals won at the 2020 Tokyo Olympics, which we can see as

international sporting success.

**Keywords:** Olympics, Economic development, Number of medals

## 1. Introduction

In recent years, interest in sports has been increasing every day, accordingly, the competition in sports has been increasing. The phenomenon of competition in sports is not only with athletes, but also turns into the fact that countries are competing with each other. Even in most countries, the international sporting success of athletes has become a source of prestige for the country and the managers who manage that country. For this reason, the source of the international sporting achievements of the countries has become the subject of research with academic circles. As a result of these studies, it is seen that the economic advanced levels of the countries are at the beginning of the factors of international sporting success. The most important reason for this situation is based on the hypothesis that countries can allocate more resources for the necessary sports infrastructure investments with their level of development and thus they can be more successful in the international sports arena (Saatcioglu, 2012).

The relationship between the economic deceleration levels of the countries and international sporting success is very rich in the literature and many empirical studies have been carried out on this subject as well. Some literature studies are as follows:

In underdeveloped countries, there is a shortage of funding for sports. Sports facilities and equipment are not at an adequate level. As a result of the Logit model forecast, it was concluded that the increase in the number of medals at the Olympics is associated with an increase in GDP and population. Economic development is the basic recipe for sporting backwardness (Andreff, 2001).

The economic situation of the country is quite important in sports. Because countries with economic prosperity can develop their sports infrastructure opportunities more effectively. Countries with a strong sports infrastructure can also develop their talented athletes more and bring success to their countries more easily in the international arena (Bernard, 2004).

Hoffman and colleagues (2004), in their study of ASEAN countries at the 2000 Sydney Olympics, found that GDP had an impact on medals won at the Olympics. However, they mentioned that this effect is limited.

Seoul 1988, Barcelona 1992, Atlanta 1996 and Sydney 2000 Summer Olympics, in the context of regression analysis are made as a result of a positive relationship between GDP and the number of medals in the Olympic Games four of these have been identified (Bian, 2005).

A correlation analysis was applied between the number of medals won at the Olympics held between 1952 and 2004 and the GDP amounts of the countries, and as a result of this analysis, the population and GDP size became the main decider of the total number of medals (Lui, 2008).

In their study, Rathke and Woitek (2008) decertified the relationship between GDP and the

number of medals obtained at the Olympics in the model they created. The model also includes population and communist country variables. According to their results, they concluded that GDP has a positive effect on the number of medals obtained at the Olympics.

A study in 2009 in China and Granger causality test between GDP per capita and investments in the sports industry, sports industry and investment per capita is the GDP of causality towards it has been determined that (Li, 2013).

Buts et al. (2013), their research for the first time examined the relationship between economic deceleration and the number of medals in the Olympics within the framework of the Paralympic Games. As a result of the research, they concluded that they have a positive effect on the GDP and the number of medals of the population.

When the literature is examined, it is noted that the level of economic development is an important determinant of sporting success at the Olympics. It is assumed that countries with a relatively large amount of GDP will be able to transfer more resources to sports infrastructure investments and thus become more successful in the international arena. Most of the empirical studies conducted in the literature have also reached conclusions according to which this assumption can be accepted.

Table 1. The total number of medals won by countries at the Tokyo 2020 Olympics

	Countries	Total Number of Medals
1	United States	113
2	China	88
3	Russian Olympic Committee	71
4	United Kingdom	65
5	Japan	58
6	Australian	46
7	Italy	40
8	Germany	37
9	Netherlands	36
10	France	33
11	Canada	24
12	Brazil	21
13	New Zealand	20
13	Hungary	20
13	South Korea	20
16	Ukraine	19
17	Spain	17
18	Cuba	15
19	Poland	14
20	Switzerland	13
20	Turkey	13

Source: IOC.

Table 1 shows the total number of medals that countries received at the 2020 Tokyo Olympics. The biggest reason why countries rank according to the total number of medals is that for most countries, the medal that will come in any sport branch, which may even be a bronze medal, is considered an indicator of international sporting success for that country. For this reason, we believe that when we rank countries by the number of medals, it will be more convenient to rank them not by the number of gold medals, but by the total number of medals.

The United States is the country with the most medals, having won 113 medals at the Tokyo 2020 Olympics. China is in second place with the number of 88 medals. These two countries

are also included in Table 2 with the same ranking.

Table 2 shows the 20 highest countries according to the amount of GDP of the countries. When ranking countries by their level of development, GDP amounts are usually used. If the amount of GDP of a country is high, it is seen that the country is more developed with its investments, infrastructure, production quantity, and the opportunities and opportunities it offers to its citizens than countries with relatively low GDP quantity (Ünsal, 2007).

Table 2. The 20 countries with the highest GDP in 2020

	Countries	GDP (Billion \$)	Total Medal Rankings
1	United States	20.936	1
2	China	14.722	2
3	Japan	5.051	5
4	Germany	3.806	9
5	United Kingdom	2.707	4
6	India	2.622	33
7	France	2.603	10
8	Italy	1.886	7
9	Canada	1.643	11
10	South Korea	1.630	13
11	Russia	1.483	3
12	Brazil	1.444	12
13	Australian	1.330	6
14	Spain	1.281	17
15	Mexico	1.076	47
16	Indonesia	1.058	42
17	Netherlands	912	9
18	Switzerland	747	20
19	Turkey	720	20
20	Saudi Arabia	700	77

Source: World Bank.

At Table 2, it can be seen that 16 of the countries in the top 20 are also included in Table 1. Even if we look only at Tables 1 and 2, we can assume that there is a relationship between the amount of GDP and the total number of medals in order to strengthen this assumption further,

statistical analyses are needed.

Education is the basis of countries economic development levels and international sporting achievements. One of the most important factors in international sporting success is sports education. One of the common features of developed countries is the importance they attach to sports education. When these countries were examined in detail, they conducted sports and education together. In this way, international sports success levels are high. For example, in the United States, sports scholarships are provided. The sports scholarship is carried out in accordance with both the student's sporting success and his/her educational success. We can determine that the United States, which is one of the most developed countries in the world (Table 2) and won the most medals at the 2020 Tokyo Olympics (Table 1), achieved these achievements through sports training.

The aim of this study ranked countries in the Summer Olympics Tokyo 2020 Top 20 international sporting success is to investigate the relationship between levels of economic development. In this context, the total number of medals of the countries in the top 20 of the total number of medals in the Tokyo 2020 Olympics was chosen as a success, while the gross domestic product levels of the countries were considered as an indicator of development.

## 2. Method

In this study, the relationship between economic development levels and countries' sporting success in the international arena was investigated with the following model established taking into the relevant literature:

$$\log (MS) = \alpha_0 + \alpha_1 \cdot \log(GSYIH) + \alpha_2 \cdot \log(NU) + \varepsilon_i \quad (1)$$

where, *MS* describes the number of medals, *GDP* is the gross domestic product, *NU* is the population variable.  $\alpha_0$  in the model represents the constant term, and  $\varepsilon_i$  represents the error term. All variables were analyzed with logarithmic values.

The total number of medals that countries have achieved at the Tokyo 2020 Olympics is available on the official website of the International Olympic Committee. The GDP figures and population figures of the countries for the year 2020 were obtained from the official website of the World Bank.

In the study, in order to investigate the relationship between sporting success and economic development levels, DECSS package program was used and the significant level was considered as  $p < 0.05$ . Correlation analysis was performed by selecting the dependent variable for the total number of medals (*MS*), the independent variable for the amount of gross domestic product (*GDP*), and the control variable for the population (*NU*).

In statistical analyses, Correlation Analysis is performed to examine the relationships variables (Bursal, 2019). The necessary assumption test before the analysis is the assumption that the variables are distributed normally. In this regard, the variables were firstly subjected to a Normal Distribution Conformity Test.

### 3. Results

In some parametric tests, the series to be analyzed must meet the normal distribution conditions. In correlation analysis, the requirement of compliance with the normal distribution is also required (Field, 2009). Hypotheses for the test of conformity to the normal distribution are established as follows:

$H_0$ : The series is in accordance with the normal distribution.

$H_1$ : The series is not suitable for normal distribution.

Table 3. The test of conformity to the normal distribution

	Kolmogorov-Smirnov		Shapiro-Wilk	
	Statistic	Sig. (p)	Statistic	Sig. (p)
log (MS)	0.181	0.072	0.930	0.137
log (GSYIH)	0.190	0.066	0.920	0.097
log (NU)	0.119	0.200	0.970	0.740

Since the  $H_0$  hypothesis cannot be rejected because it is at a 5% significance level,  $p < 0.05$  in the Kolmogorov-Smirnov test, we can say that all of our series correspond to the normal distribution.

Since our series are in accordance with the normal distribution, we can perform Correlation Analysis. Correlation analysis helps us to decipher the mutual relationship between variables. When applying the correlation analysis, the population variable was considered as the control variable. So the effects are under control. The assumptions of correlation analysis are as follows:

$H_0$ : There is no relationship the variables.

$H_1$ : There is a relationship the variables.

Table 4. Correlation tests

Correlations				
Control Variables			Log (MS)	Log (GSYIH)
Log (NU)	Log (MS)	Correlation	1.000	0.554
		Significance	-	0.006
	Log (GSYIH)	Correlation	0.554	1.000
		Significance	0.006	-

Since the calculated significance value is  $p < 0.05$ , the  $H_0$  hypothesis is rejected for this relationship and it is concluded that the relationship between GDP and number of medal points is at a significant level. When the population variable was checked, the correlation coefficient between GDP and the number of Medals determined as ( $r = 0.554$ ;  $n = 18$ ;  $p = 0.006$ ).

The correlation coefficient ( $r$ ) varies between -1 and 1. Decimation of A coefficient deceleration to -1 indicates a strong inverse relationship between the variables, while a coefficient deceleration to 1 indicates a strong relationship between the variables in the correct direction (Bursal, 2017).

The  $r$  value obtained as a result of the analysis is 0.554. In other words, there is a strong positive relationship between GDP and the Total Number of Medals. There is a strong positive relationship between GDP and total number of medals.

#### **4. Discussion**

The most important factor that comes to the fore in the literature investigating the issue of which factors determine the success of countries in the Olympics is the level of economic development. Talent is a very important factor for success in sports, but the discovery of talented athletes and the development of their abilities require infrastructure investments in sports area (Saatcioglu, 2012).

From a theoretical point of view, it is suggested that economically developed countries can transfer more resources to sports infrastructure investments and thus become more successful. It is also accepted that more effective participation of sports in education in rich countries and a high probability that individuals will find more free time that they can devote to sports will also have a positive impact on sports success. Most of the empirical studies in the literature also confirm this opinion, which we mentioned about, and give the conclusion that the level of economic development positively affects sporting success.

16 of the countries that are in the top 20 ranking in terms of GDP are again in the total medal rankings of the Tokyo 2020 Olympics. We can say that with the support of the literature for these 16 countries, it is an expected result that they will be included in both tables. However, it is worth mentioning the countries that are not included in both tables.

Although India, Mexico, Indonesia and Saudi Arabia are in the top 20 in terms of GDP, they are not in the top 20 in terms of the total number of medals (Total Medal Ranking: India: 33, Indonesia: 42, Mexico: 47, Saudi Arabia: 77). There may be many reasons for this situation for each country. Among these reasons, there are many factors; investments in which areas it is their source of sports infrastructure and the amount of sport in the interests of the people and the rulers of the total population, the percentage of the young population are connected to political and cultural structures, climatic features.

New Zealand, Hungary, Ukraine, Cuba and Poland are not in the top 20 in terms of GDP. Despite this, they managed to get into the 20th place in terms of the total number of medals (Total Medal Standings: New Zealand: 13, Hungary: 13, Ukraine: 16, Cuba: 18, Poland: 19).



Although these countries are relatively behind in terms of economic development level, it can be predicted that they achieve success with their infrastructure investments in sports, the importance they attach to sports and the athlete, and the necessary importance to sports in their education systems.

The common aspect of New Zealand, Hungary, Ukraine, Cuba and Poland is that they were previously or are still governed by a socialist regime (except: New Zealand). Socialist regimes use sports, sports organizations and success in sports as political propaganda (Kılıç, 2016). Due to the fact that sport is used as a propaganda purpose, sport takes an important place, especially in the education sector. For this reason, since aspects such as the discovery of talented players and the development of their abilities will be realized more easily, the impact on international sporting success is quite large. Although other countries today, except Cuba, do not implement the socialist regime, the discipline of sports in education from the past continues to be active today.

In deciphering the relationship between GDP and the total number of medals, we added the population variable to our model as a control variable in our study. The main reason for this is due to the fact that the population variable is also often considered when studying this issue in the literature. Because the population is an important variable in terms of the ability to win an Olympic medal (Moosa, 2004). However, in the correlation analysis that we applied, we took the effects of the population variable under control and included it as a modeled control variable.

The results obtained in our study are similar to the results of studies conducted in the literature. The results of the study revealed the relationship between economic development and international sporting success at the Tokyo 2020 Olympics.

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