Building a case for incorporating sport as an indicator in human development index

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Abstract

Purpose United Nations General Assembly adopted a resolution 73/24 on 3rd December 2018, to recognize sport as an enabler of sustainable development. To examine whether sport really plays an enabling role, the medals ranking of countries on the basis of medals obtained (per million population) in Summer Olympics during the five Olympics games over the first two decades of 21st century has been chosen as an indicator of sports achievement of a country and has been compared with their Human Development Index (HDI) ranking during that particular year of Olympics. The aim of this research was to examine the correlation between sports achievement and HDI.

Methods This research uses the Summer Olympic Rank as per medals obtained per million population (for the years 2000, 2004, 2008, 2012, 2016) of various countries as the Indicator of their sports achievement and compares them with their HDI Rank during these specific years.

Results The researchers tested the hypothesis that the higher the sports achievement, the higher the HDI of a country and vice-versa. The analysis shows a very high positive correlation between the Olympic medal ranking and the HDI ranking, revealing that the countries with higher sports achievement have higher HDI.

Conclusions Hence, the conclusion is, if a sport is include in HDI as an indicator of the Human Development Index, sport could become an important vehicle for the improvement of HDI, especially in low and middle-income countries where the sports achievement is low and the HDI is also low.

Keywords Sports achievement · Olympics medals · Human development index · Low-cost sport infrastructure · Low and middle-income countries

Introduction

United Nations General Assembly adopted resolution 58/5 in November 2003, to declare, “Sport as a means to promote education, health, development and peace” [1]. Some writers have even argued that sport development in a region would make the people healthy: physically, spiritually and socially, leading to better achievement of the national goals, especially a democratic, just and prosperous society [2]. In a sense, if a sport is given an adequate recognition as an indicator in HDI, sport could play a significant role in public health promotion and improve the health indicators as well as the overall HDI of a nation. Sport provides this unique opportunity to encourage adults to adopt an active lifestyle through games and physical activities in an interesting way with the option for adults to choose the games of their choice. Unleashing the power of sport could help to build a healthy nation with a healthy population (i.e. to improve the health indicators of HDI). Tarigan et al. [2] have suggested that the culture of the sport should be developed from the smallest scope of society, the family, the larger community in the school environment and sport clubs. On 3rd December 2018, United Nations General Assembly adopted a resolution 73/24 to recognize “sport as an enabler of sustainable development” [3]. To examine whether sport really plays an enabling role, Olympic Medals (per million population) ranking of countries over the years (2000, 2004, 2008, 2012 and 2016) has been chosen as an Indicator of the sports achievement of a country and has been compared with their HDI ranking during that particular year of Olympics to examine the correlation between sports achievement and
HDI. This paper reports the results of the research that tested the hypothesis that the higher the sports achievement, the higher the HDI of a country and vice-versa.

**Literature review**

There is a significant gap in the literature and very few articles have been published which look into the role of sport in influencing the HDI. In this section, some of the articles published in the recent past, which are nearest to the topic of this paper, are summarized. Santos et al. [4] while examining the influence of socioeconomic factors in sports achievement, found that nationalities with higher HDI have been doing very well in the sprint races in various world athletics competitions. Similarly, Gomez-Sentone et al. [5] studied the relationship between the HDI and the sport outcome of Brazilian swimmers and their results revealed that Brazilian cities with higher HDI, provided greater chances for competitive-level success. In another research, Dumith et al. [6] looked into the worldwide prevalence of physical inactivity to analyze its association with the development level of each country and came to the conclusion that physical inactivity was more prevalent among wealthier and urbanised countries, and among women and elderly individuals. However, very few papers have been published related to the subject of this article. This article makes an attempt to fill this gap in the literature by using the Summer Olympic Rank as per medals obtained per million population (for the years 2000, 2004, 2008, 2012, and 2016) of various countries as an indicator of sport achievement of the nations and compare them with their HDI Rank.

**Methodology**

This research proposes to test the hypothesis that the higher the sports achievement, the higher the HDI of a country and vice-versa. Theoretically, the population should play a determining role in the total number of medals a country gets and the countries having a larger population with a deeper pool of talented athletes would have a greater chance of winning maximum medals [7]. But in reality that does not happen and the absolute number of Summer Olympic medals won by a country does not correspond to the country’s population. Since the population of these medal-winning countries varied widely, it was decided that converting the data to Summer Olympic medals per million population will lead to the normalization of the data and truly reflect the overall sports development of a particular country thereby enabling a more meaningful analysis of the data in this research. Hence Summer Olympic medals per million of the population was chosen for this research study as an indicator of sport achievement at the international level. The medals that various countries won during the Summer Olympics in the years 2000, 2004, 2008, 2008 and 2016 were considered for this research. Thereafter the medals per million population were compared with the HDI Rank of these countries for these same years 2000, 2004, 2008, 2012 and 2016 (the years when the Olympics were held). The data for this research were obtained from the following open sources easily available on the Internet: (1) http://www.medalsproject.org (2) http://hdr.undp.org/en/content/human-development-index-hdi and (3) https://countryeconomy.com/hdi. Pearson correlation coefficient (r) was used to test for linear correlation between the Summer Olympics Ranking as per medals per million population and the HDI Rank of the countries for a particular year in which the Summer Olympics were held.

All the medal-winning countries in the Summer Olympics of 2000, 2004, 2008, 2012 and 2016 were initially considered and then through a process (explained in the subsequent paragraphs), a particular number of countries were selected for comparison with their HDI Rank. The rationale for exceptions include the fact that some athletes from low-income African nations have occasionally recorded outstanding performances at international sport competitions. However, it is debatable whether the outstanding feats of these athletes are a true reflection of the overall development of sport in their countries [8]. It seems that environmental factors enable African athletes to perform better in middle and long-distance races. In this regard, Santos et al. [5] explain that some tribes live in high altitudes, that is, with some level of hypoxia, which in turn stimulates erythropoiesis, leading to an increase in hemoglobin, favoring a greater transportation and consumption of oxygen, a better aerobic performance. This is the main reason, they say, leading to medal winners in middle and long-distance races from some African countries in international sport competitions. Hence, athletes from these low-income African countries are winning Olympic medals for environmental factors unique to their countries, while these nations have a low score on Human Development Index and therefore these countries are treated as exceptions.

**Results**

For the Summer Olympics 2000, the comparative information of Olympic Rank within these 46 countries as per medals per million population versus HDI Rank of these 46 countries is represented in the Fig. 1 below.

The total medal-winning countries in Summer Olympic 2000 were 80. Amongst these 80 countries the HDI data was available for 73 countries and for seven countries HDI data was not found. Within these 73 countries, 58 countries that got more than one medal were initially selected. There were 12 countries (amongst the 58 selected countries), which
were found to be exceptions (for reasons explained in the discussion section) and hence the data of the Olympic medals per million population was compared with the HDI Rank for the 46 countries. Pearson correlation coefficient \( r \) was used to test for the linear correlation between the Olympic Rank within these 46 countries as per Olympic medals per million population and the HDI Rank of these 46 countries for the year 2000. Pearson correlation coefficient \( r \) was found to be 0.70 for the year 2000.

For the Summer Olympics 2004, the comparative information of Olympic Rank within these 47 countries as per medals per million population versus HDI Rank of these 47 countries is represented in Fig. 2 below.

In Summer Olympic 2004, the total medal-winning countries were 79. Amongst these 79 countries the HDI data was available for 70 countries and for nine countries HDI data was not found. Within these 70 countries, 59 countries that got more than one medal were initially selected. There were 12 countries (amongst the 59 selected countries) that were found to be exceptions (for reasons explained in the discussion section) and hence the data of the Olympic Rank within these 47 countries as per medals per million population was compared with the HDI Rank for the 47 countries. Pearson correlation coefficient \( r \) was used to test for linear correlation between the Olympic Rank within these 47 countries as per medals per million population and the HDI Rank of these 47 countries for the year 2004. Pearson correlation coefficient \( r \) was found to be 0.71 for the year 2004.

For the Summer Olympics 2008, the comparative information of Olympic Rank within these 49 countries as per medals per million population versus HDI Rank of these 49 countries is represented in Fig. 2 below.
medals per million population versus HDI Rank of these 49 countries is represented in Fig. 3 below.

The total medal-winning countries in Summer Olympic 2008 were 88. Amongst these 88 countries the HDI data was available for 78 countries and for seven countries HDI data was not found. Within these 78 countries, 61 countries that got more than one medal were initially selected. There were 12 countries (amongst 61 selected countries), which were found to be exceptions (for reasons explained in the discussion section) and hence the data of the Olympic Rank within these 49 countries as per medals per million population was compared with the HDI Rank for the 49 countries. Pearson correlation coefficient ($r$) was used to test for linear correlation between the Olympic Rank within these 49 countries as per medals per million population and the HDI Rank of these 49 countries for the year 2008. Pearson correlation coefficient ($r$) was found to be 0.71 for the year 2008.

For the Summer Olympics 2012, the comparative information of Olympic Rank within these 47 countries as per medals per million population versus HDI Rank of these 47 countries is represented in Fig. 4 below.

In the Summer Olympic 2012, there were total of 84 medal winning countries. amongst these 84 countries, the HDI data is available for 72 countries and for 12 countries HDI data was not found. Within these 72 countries, 59 countries that got more than one medal were initially selected. There were 12 countries (amongst 59 initially selected) found to be exceptions (for reasons explained in the discussion section) and hence the data of the Olympic Rank within these 47 countries as per medals per million population was compared with the HDI Rank for the 47 countries. Pearson correlation coefficient ($r$) was found to be 0.69 for the year 2012.

**Fig. 3** Summer Olympics 2008: comparison of the Olympic rank within these 49 countries as per medals per million population versus HDI rank of these 49 countries

**Fig. 4** Summer Olympics 2012: comparison of the Olympic rank within these 47 countries as per medals per million population versus HDI rank of these 47 countries
A correlation coefficient \( (r) \) was used to test for linear correlation between medals per million population and the HDI Rank of these 47 countries for the year 2012. Pearson correlation coefficient \( (r) \) was found to be 0.65 for the year 2012.

For the Summer Olympics 2016, the comparative information of Olympic Rank within these 44 countries as per medals per million population versus HDI Rank of these 44 countries is represented in Fig. 5 below.

The total medal-winning countries in Summer Olympic 2016 were 84. Amongst these 84 countries, the HDI data was available for 71 countries and for 13 countries HDI data was not found. Within these 71 countries, 56 countries that got more than one medal were initially selected. There were 12 countries (amongst 56 initially selected countries) found to be exceptions (for reasons explained in the discussion section) and hence the data of the Olympic Rank within these 44 countries as per medals per million population was compared with the HDI Rank for the 44 countries. Pearson correlation coefficient \( (r) \) was used to test for linear correlation between the Olympics Rank as per medals per million population and the HDI Rank of these 44 countries for the year 2016. Pearson correlation coefficient \( (r) \) was found to be 0.70 for the year 2016.

**Discussion**

The results of this research study presented above reveal that there is a reasonably strong positive correlation between a country’s Olympic performance and HDI and the countries with higher sport achievement, have higher HDI as well, with a few exceptions (as explained the methodology section). As we have seen in the preceding paragraphs, countries with higher HDI are performing better in international competitive sport, i.e. winning more medals in the Olympics. Including sport Indicators as one of the parameters to measure the HDI would encourage low-income and middle-income countries to use sport as a vehicle for improving the HDI. Quite often, an open field that converts into a football ground where children play soccer is a very low-cost sport facility but many international football players have emerged playing in such low-cost sport infrastructures. What is required to be done by the Governments is to institutionalize this arrangement by systematically identifying open public land in villages, towns and cities and creating low-cost sport infrastructures such as football grounds, volleyball courts, basketball courts, etc. which the children and youth can use regularly for developing their sports skills. Gradually, Governments may decide to provide coaches and trainers in a particular sport, when young talented players start emerging from a particular local area. Through systematic training in a particular sport, these young talented sportspersons could become National Champions or even International medal winners. Encouraging sports in communities will not only create opportunities for young talented players to fulfill their dreams as sportspersons but it is also likely to create healthy communities.

United Nations Inter-Agency Taskforce of Sport for Development and Peace has defined sport as all forms of physical activity that contribute to physical fitness, mental well-being and social interaction, such as play, recreation, organized or competitive sport, and indigenous sport and games [9]. Not surprisingly, sport development has become an important human development goal in almost all countries that we are familiar with [9] since sport makes a major contribution to health, education, women’s empowerment and social inclusion [10]. In simple terms “sport development” is associated with the promotion of sport-for-all objectives so that more people play sport, talent identification, nurturing and developing athlete pathways and linking

![Fig. 5 Summer Olympics 2016: comparison of the Olympic rank within these 44 countries as per medals per million population versus HDI rank of these 44 countries](image-url)
sport to other social objectives such as health promotion and community regeneration [11, 12]. Santos et al. [5] argue that public policies should be directed towards mass participation in sport in all categories because sport is an important vehicle for the promotion of good health and better quality of life during aging which would ultimately lead to disease prevention leading to minimization of financial expenses in medical treatments. Sport can also be used as a medium of socialization through interaction and communication [2] to improve the overall psychological health of community.

United Nations has proposed re-envisioning of sport as both an end and a means in the recovery from the impacts of COVID-19 [3] because sport contributes to significant physical benefits, such as improving general well-being, extending life expectancy, reducing chances of several major diseases (heart disease, diabetes, cancer, etc.) and also provides psychological benefits, such as reducing depression and improving concentration [10]. Hence, making sport (i.e., sport Indicators) an integral part of the HDI may lead to multifarious benefits, especially for middle-income and lower-income countries. First, perhaps countries that wish to improve HDI scores may start taking steps so that sport is taken more seriously in the schools, colleges and communities in general. Second, giving importance to sport in HDI may lead to countries starting new initiatives to encourage citizens to spend more time on sport-related activities and less time on sedentary activities such as using mobile or watching televisions.

For example, it is a well-known fact that people are spending lots of their valuable time on non-useful activities on their mobile (such as mobile games) as part of their sedentary lifestyle. As a consequence, mobile usage is gradually becoming an addiction especially among the youth [13]. In an article published in December 2003, with a headline “Mobile phones becoming a major addiction” The Sydney Morning Herald [14], the article emphatically stated that “Psychiatrists say mobile phone addiction is an obsessive–compulsive disorder which looks set to become one of the biggest non-drug addictions in the 21st century”. Now, health authorities around the world have recognized health problems such as headaches, insomnia, problems in the brain, blurred vision, eye fatigue, burning and itching sensation in the eyes, neck pain and even psychological problems that are associated with excessive use of mobile phones [15–17].

Li et al. [18] published their research study to demonstrate that sedentary behavior is associated with an increased risk of cancer among Chinese adults, and they recommended that it is necessary to reduce sedentary time and to increasing moderate-to-vigorous physical activity levels, for the prevention of cancer and premature death. Hence, investment in community sport and physical activity-related infrastructures (as an incentive to citizens) may bring down the number of people suffering from chronic diseases such as diabetics, cardiac ailments, obesity, etc. (arising out of a sedentary lifestyle). Hence creating low-cost sport infrastructures (such as football grounds, volleyball courts, basketball courts, etc.) utilizing vacant public land in villages, towns and cities could go a long way in keeping the community healthy, especially the youth. Taking initiatives to play sport regularly, creating low-cost sport infrastructure to keep people “fit and healthy” rather than creating healthcare infrastructure to treat them when they are ill, could also make more sense to International Donor Organizations who give aid to low-income countries for improving their HDI. Ultimately, making an attempt to improve the health indicators through sport-related activities would reduce the burden on the already overstretched public healthcare systems.

In an interesting recent study Cunningham [19] examined the county-level associations of physical activity with coronavirus disease (COVID-19) cases and deaths, per 100,000 county residents in the USA. His results offer empirical evidence of the benefits of county-level physical activity during a pandemic and recommend promoting physical activities such as exercising more at home, using home fitness machines, walking and running outdoors in open spaces, and practicing yoga [20, 21] during the coronavirus pandemic. Hence, this approach to encourage the population to remain healthy and increase their immunity through sport-related activities achieves much greater significance in the current scenario and will receive a big boost if the subject of sport (i.e., sport Indicators) is included in the HDI and counted in the HDI Score.

As explained above this research has various public policy implications and practical implications for public service organizations and managers handling the responsibility of providing sports facilities to citizens. Including sport indicators in the HDI, could be a major public policy decision that could change the public perception of sport as an essential mainstream activity rather than an extra-curricular activity. Some of the major practical implications of this research could be that the National Governments around the world would create more sport facilities, making sport more accessible to citizens and encourage people to take-up sport as a regular activity for a healthy lifestyle, ultimately improving their Country’s Human Development Index.

One limitation of the study is that this study takes into account the data from the year 2000 up to 2016 and this research was completed before the Tokyo Summer Olympics 2021 held in August 2021 because this research was conducted with limited personal resources and without any aid or funding from any organization. With adequate resources (i.e. funding from an organization), this research could be extended to look into the data for a longer period of time e.g. over a 60 year period from 1960 to 2021. Moreover, adequate resources would enable conducting a more in-depth research into the
reasons why and how athletes of some low-income countries are continuously performing so well in International Competitions of Track and Field events.

Further research needs to be conducted to look into the correlation between sport development and health indicators, i.e. whether countries having higher sport achievement in international competitions also have better health indicators. In the next phase of this research, the author proposes to compare the sport achievement of the Olympic medal-winning countries (i.e. Olympic medals per million population) with the Health Indicators of these countries.

**Conclusion**

This paper presented the results of the research study which tested the hypothesis that the higher the sports achievement, the higher the HDI of a country and vice-versa, comparing the data of medals won by various countries during the Summer Olympics in the years 2000, 2004, 2008, 2008 and 2016 and the HDI of these countries during the Year of Olympics. The results reveal that there is a reasonably strong positive correlation between a country’s Olympic performance and HDI. The countries with higher performance in sport generally have higher HDI score, with a few exceptions of some athletes from low-income African nations. This gives us hope that if the power of sport is unleashed in a true sense, sport could become an important vehicle to improve HDI, especially in low-income and middle-income countries. Sport needs to be recognized as a vital force to build a healthy population, enhancing the quality of life, open avenues of decent employment for youth, a road out of poverty, and a mean to improve the overall HDI of a country, by including sports Indicators in the measurement of HDI.

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**Declarations**

**Conflict of interest**  There is no conflict of interest.

**Ethical approval**  This article does not contain any studies with human participants or animals performed by any of the authors.

**Human and animal rights**  No human rights or animal rights were violated.

**Informed consent**  In this research, publicly available secondary data of Olympics medals and Human Development Index were obtained from the web pages on the internet cited in the paper. Hence the question of informed consent does not arise in this research.

**References**

1. United Nations General Assembly (UNGA, 2003). Resolution number 58/5 adopted by the general assembly on 3 November 2003, United Nations. https://undocs.org/en/A/RES/58/5. Accessed 02 Mar 2022
2. Tarigan S, Sugiyanto S, Purnama SK (2018) Result of government public policies related to development of sport in the metro city based on the sport development index. Int J Multicult Multireligious Underst 5:49–57
3. United Nations General Assembly (UNGA, 2018). Sport as an enabler of sustainable development: resolution No.73/24 adopted by the UN general assembly on 3 December 2018. https://www.unodc.org/documents/Safeguardingsport/Documents/res._73.24.pdf. Accessed on 02 Mar 2022
4. Santos PA, Sousa CV, Da Silva Aguiar S et al (2019) Human development index and the frequency of nations in athletics world rankings. Sport Sci Health 15:39–398
5. Gomez-Sentone R, Gil JFL, Caetano CI, Cavicchioli FR (2019) Relationship between the human development index (HDI) and the sport results of Brazilian swimming athletes. J Human Sport Exercise 14:2009–2018
6. Dumith SC, Hallal PC, Reis RS, Kohl HW (2011) Worldwide prevalence of physical inactivity and its association with human development index in 76 countries. Prev Med 53:24–28
7. Bernard A, Busse M (2004) Who wins the Olympic games? Economic resources and medal totals. Rev Econ Stat 86:413–417
8. Toriola A, Adetoro A, Toriola O, Igbokwe N (2000) A comparative analysis of youth sport programmes in Botswana and Nigeria. Int Sport Stud 22:57–73
9. United Nations Inter-Agency Task Force Report on Sport for Development and Peace (2003) Towards achieving the millennium development goals. Switzerland, Geneva
10. UN General Assembly (UNGA, 2015). Transforming our world: The 2030 agenda for sustainable development. https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf. Accessed 02 Mar 2022
11. Houlihan B, Green M (2010) Routledge handbook of sport development. Routledge, London
12. Sam MP (2016) Sport Development. In: Hoye R, Parent M (eds) Sage handbook of sport management. Sage Publications, New York
13. Shambar R, Rugimbana R, Zhowa T (2012) Are mobile phones the 21st century addiction? Afr J Bus Manage 6:573–577
14. The Sydney Morning Herald (2003): Mobile phones becoming a major addiction. Available online at: https://www.smh.com.au/technology/mobile-phones-becoming-a-major-addiction-20031210-gdhyf7.html. Accessed on 05 Mar 2022
15. Gunter B (2019) “Health risks and mobile phones”, children and mobile phones: adoption, use, impact, and control. Emerald Publishing Limited, Bingley, pp 79–97. https://doi.org/10.1108/00332747.2021.1907870
16. Salfi F, Amicucci G, Corigliano D et al (2020) Changes of evening and bedtime melatonin levels in insomnia patients. Sleep Sci Health 19:177–184
17. Chatterjee S, Kar S (2021) Smartphone addiction and quality of sleep among Indian medical students. Psychiatry 84:182–191. https://doi.org/10.1080/00332747.2021.1907870
18. Lin Y, Liu Q et al (2021) Adverse associations of sedentary behavior with cancer incidence and all cause mortality: a prospective cohort study. J Sport Health Sci 10:560–569. https://doi.org/10.1016/j.jshs.2021.04.002
19. Cunningham GB (2021) Physical activity and its relationship with COVID-19 cases and deaths: analysis of US counties. J Sport Health Sci 10:570–576. https://doi.org/10.1016/j.jshs.2021.03.008
20. Hammami A, Harrabi B, Mohr M, Krstrup P (2019) Physical activity and coronavirus disease (COVID-19): specific recommendations for homebased physical training. Manag Sport Leisure 27:26–31. https://doi.org/10.1080/23750472.2020.1757494
21. Nyenhuis SM, Greiwe J, Zeiger JS, Nanda A, Cooke A (2020) Exercise and fitness in the age of social distancing during the COVID-19 pandemic. J Allergy Clin Immunol Pract 8(7):2152–2155. https://doi.org/10.1016/j.jaip.2020.04.039

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