To what extent do socioeconomic factors such as HDI, continental origin, and previous host advantage affect paralympic medal winning?

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Abstract

This research examines the extent to which socioeconomic factors – HDI (Human Development Index), continental origin, and previous host status – affect medal distribution. This study takes the most recent 2024 Paris Paralympics as the focus, with the tests being conducted on secondary data collected from the official Paralympics website. A multitude of statistical methods and analyses were utilised to test the data, such as the Theil Index, standard deviation, etc. The research identifies significant disparities and deviations in the Paralympic medal dispersion. The findings of this study reveal that nations with higher HDI scores, primarily those in Europe and North America, win a significant large proportion of the medal count, while countries with lower HDI scores originating from other continents (Africa, South America, Asia) tend to struggle and face significant hurdles. Additionally, this study analyses previous host advantage, which is the phenomenon where countries that have previously hosted the Olympics or Paralympics tend to perform better due to increased investment in sports infrastructure, government support, and societal awareness. This study is at the intersection of development, geography, and equality – aiming to raise critical awareness regarding fairness, elitism, and accessibility in disabled sports. The findings from this study emphasize the need for policy interventions in order to create more equitable and fair opportunities for athletes regardless of their country's HDI score, continental placement, or any other limiting factor.

1. Introduction

The Paralympics should be a story of great success and inspiration, with athletes at the top of their game venturing far and dreaming big, occasionally even breaking Olympic World Records, yet despite this, they receive a fraction of the attention that the Olympics and other sporting events do. This addresses the first reason for writing this paper: to spread awareness regarding this event that has inspired many. The Paralympics were introduced after World War II; however, they only had their official games in 1960 in Rome, Italy. At first, the Paralympics and Olympics were held separately; however, they have been in congruence since the 1988 Olympics. The Paralympics have four core values: determination, equality, inspiration, and courage. These values attempt to encompass what it means to be a Paralympic athlete and the very essence of the games themselves.

"Courage: It encompasses the unique spirit of the Paralympic athlete who seeks to accomplish what the general public deems unexpected, but what the athlete knows as a truth."
"Determination: The manifestation of the idea that Paralympic athletes push their physical ability to the absolute limit."
"Inspiration: When intense and personal affection is begotten from the stories and accomplishments of Paralympic athletes, and the effect is applying this spirit to one's personal life."
"Equality: Paralympic Sport acts as an agent for change to break down social barriers of discrimination for persons with an impairment."

With the last value, equality, this paper takes a special interest in. In this paper, we review data from the most recent 2024 Paris Paralympics, to explore the extent to which socioeconomic factors: a country's HDI score, continent of origin, and even whether being a previous host affect the medal distribution at the Paralympics. This paper shall then show that these factors do indeed affect distribution to a worrying degree, raising questions at the intersection between a country's development, geographic location, and equality.

Literature review:
The Paralympics have a rich historical context rooted in the equality and the involvement of athletes with disabilities. Since their establishment in 1948, which then grew significantly, with the size to the global recognition, reflecting the broader sentiment of understanding and accepting people with disabilities. Despite the growing popularity, the Paralympics are very limited in comparison to the Olympics. The variation in recognition is a key aspect of interest in this paper, which aims to shed light on the socio-economics factors that influence the media distribution and the public's image towards equality within the Games.

Historical context and the growth of the Paralympics:
Though originally started in Rome, Italy, in 1960, the Paralympic Games were first introduced as a rehabilitation project for World War II veterans returning home. Since then, they have grown from a limited-scale event to a fiercely competitive global sport event highlighting disabled athletes' abilities. Still, their representation is low in public debate and media even though they have changed. Based on academic and narrative author Bailey et al. The Paralympics suffer from what the authors call a "paralympic paradox," where athletes who challenge physical restrictions but are usually ignored by popular media outlets and the lack of media coverage for the Paralympics are a major element blocking the global visibility of the Games.

The growth of the Paralympics runs parallel with the broader global movement for disability rights. Studies by Tom Heffernan on the growth of disabled sports have highlighted the Paralympics' major influence in changing the public's perspective on disabilities. According to many literature authors, such as Tom Herrfann and Tom Shakespeare, as quoted "The Paralympics have the potential to be much more than a sporting event. They can change the way we think about disability, not just in the context of sport, but in all aspects of society. They challenge stereotypes, redefine what is possible for people with disabilities, and inspire social change.". The Paralympic Games provided unique opportunities to develop the narrative knowledge on disabilities, from a limitation to changing it into a possibility. This kind of transformation began to be seen when the games started to align with the summer and winter Olympics starting in 1988, marking a new beginning for acknowledgement.

Core values of the Paralympics:
The core values of the Paralympics – Courage, determination, inspiration and equality – served as the initial foundation for the Games. These values reflect the athletes' spirit and emphasize the possibility of the Games as a stage for social transformation. Earlier studies of Paralympic values highlight their role not only in inspiring ideals, but also in fueling athlete's performance. The concept of "courage" in the Paralympics games, not just involves the physical expression of bravery, but also the mentality concept of resilience, as athletes have to overcome the tasks of societal barriers and personal challenges.

Furthermore, under great academic debate is the idea of "equality" in the setting of the Paralympic Games. According to many narrative viewing, the Paralympics Games are not just a successful competition, rather they reshape how society views the very idea of disability itself. The Games have significantly served as a symbol of breaking down stereotypes, challenging the public's discrimination against disabled athletes and advocating for a more balanced atmosphere of societal acceptance.

Socio-economics Factors and Medals Distribution:
Particularly, an important examination of this research paper of how socio-economics factors- especially the Human Development Index (HDI) of a country, its geographical location and its history as an Olympics or Paralympics host affect its athletes chances of winning medals. Research on socio-economic inequalities in Paralympic and Olympic performance has found trends indicating that more affluent and more advanced nations normally excel in overseas athletic activities (26). The socio-economic inequalities in Paralympic and Olympic performance showcase trends indicating that more affluent and more advanced nations normally excel in overseas athletic activities.

Drawing on narrative and academic sources, which contend that athletes from more prosperous countries typically have more resources available to them and therefore perform better, studies by authors such as MacNamara, Áine, and David Collins, have concentrated on the link between a nation's development and its Paralympic success. Moreover, they observe that nations with higher HDI ratings are better positioned to offer the support systems and physical facilities needed for disabled athletes, hence raising their chances of Games success.

Another factor that causes a huge influence on the medal distribution is the “previous host advantage”, where countries who have previously hosted the Games tend to have better performances in future Games. This kind of advantage has been linked to investments in the sports national pride and media exposure. The previous hosts gain a variety of long-term effects, which include the increase of funding for the athletes development, facilities and their national morale.

For the purposes of this study, the two medals won by the Refugee Olympic Team were excluded from all calculations and the total medal count. As a result, the dataset analyzed comprised 1,634 medals instead of the full 1,636.

Given that the study examines how the continental origin of different regions affects their performance in the paralympics, it would be arbitrary to assign the 2 medals of the Refugee Team to a specific country. This is most primarily done due to the fact that the Refugee Team is composed of athletes from multiple continents and countries.

Moreover, this study considers the previous host advantage, where countries that have previously hosted the Olympics and Paralympics tend to perform better due to increased investment in sports infrastructure, government support, and athlete development. Because the Refugee Team is not tied to any specific host nation, its inclusion would provide no meaningful insight into this factor. Similarly, since the Refugee Paralympic Team are from various countries, they do not have a specific HDI to be used for comparison.

2. Researches Questions 1 and 2

2.1: Research Question 1

What stood out the most whilst plotting the medal count and HDI score data on the graphs was that the countries at the top of the medal count were primarily high HDI countries and originated in Europe or North America; ergo, this is where research question one came about: **do countries that have a higher HDI score win more medals than countries with a low HDI score?** This question was addressed through testing the data firstly through Standard Deviation and the Coefficient of Variation to test whether the hypothesis was correct. Proceedingly, the Theil index was then utilised to find the overall amount of inequality present in the paralympic medal deviation, and quintile specific inequality, thus answering the first research question.

2.2: Research Question 2

Yet, throughout these tests, there were some discrepancies, particularly in the middle HDI tier that could not be explained only through HDI. This still led to the second research question: **to what extent does a country's geographical location and previous host status affect its chances of medal winning?** The methods highlighted and mentioned above were used throughout the study to attempt to answer research questions one and two. Additionally, the data visualization techniques attempted to portray the data in a variety of different ways (statistical such as in the lorenz curve and representative such as in the 3D scatter plot and 3D surface plot) that would help answer both questions.

3. Methodology

This study uses a quantitative, positivist approach to analyze the inequality in Paralympic medal distribution. The research primarily investigates whether a country's Human Development Index (HDI) score, continental origin, and previous host status influence its medal count at the Paris 2024 Paralympic Games. A variety of statistical methods and mathematical models were used to quantify/measure disparities and test the research hypotheses alongside with the research questions that arose throughout.

3.1 Data Collection and Sources

The data used in this study is secondary and was primarily sourced from:

> **3.1.1** The official Paris 2024 Paralympics website (1), which provided medal counts for each participating country.

3.1.2 The United Nations Development Programme (UNDP) Human Development Reports (2), from which each country's HDI score was extracted.

3.2 Data Processing and Organization

In order to break up the data and ensure both ease of accessibility and efficiency, the data was organised as listed below:

3.2.1 Countries were categorized into quintiles based on their HDI scores, allowing for comparisons between , five different tiers of HDI nations, including high, medium, and low, which were the three tiers primarily compared

3.2.2 Countries were grouped into their respective continents in order to test RQ2 of whether continental origin and/or previous host status had a significant impact on medal count

3.2.2.1 This was done through attributing a specific number 1 - 6 to each continent, this number was then given to all the countries of that respective continent

i. 1 - Africa
ii. 2 - South America
iii. 3 - Oceania
iv. 4 - Asia
v. 5 - North America
vi. 6 - Europe

3.2.2.2 Additionally, a compilation of all the 15 previous host nations was made, and the amount of previous hosts per continent were counted (see table 3)

3.2.3 The Top, middle, and bottom quintiles respective medal breakup per sport was broken down and tabularised for comparison (see table 6)

3.2.4 A break of Para Equestrian participant countries HDI scores was compiled while noting the country and respective continental origin (See table 7)

3.3 Statistical Methods and Inequality Measures

To analyze the research questions, three primary steps were used in the statistical approach, progressing from basic analysis methods to more advanced inequality indices:

3.3.1 Formula specific tables were created (medals, HDI, Standard Deviation, and Theil Index tables primarily) for accuracy of testing data

3.3.1.1 Theil Index table was broken into quintiles to calculate the respective quintile specific data and score (see table five)

3.3.2 Simple tabulation of data and comparison of differing percentages of medals found in different continents and HDI Tiers (see tables)

3.3.3 Mean of the total data set was calculated for medal distribution, arguably setting the foundation for the coming statistical analyses

3.3.3.1 Additionally, mean for each of the four different HDI tiers set by the UNDP was calculated and tabulated for comparison against the global representation of that respective HDI tier

3.3.4 Standard Deviation (SD) was used to assess the overall spread of medal counts and determine how dispersed the distribution was in relation to the mean

3.3.4.1 Formula for standard deviation: $\sigma = \sqrt{\frac{\Sigma(x_i - \mu)^2}{N}}$

- σ = population standard deviation
- x_i = number of medals won by each country
- μ = mean across all countries (average of all the data points)
- N= total number of countries in dataset
- $x_i - \mu$ = deviation of each individual data point from the mean
- $(x_i - \mu)^2$ = square difference to ensure all values are positive
- Σ = summation symbol, adding all the squared deviations

3.3.5 Theil Index was used to analyse the amount of overall inequality for the total data set along with the Quintile specific amount of inequality and dispersion

3.3.5.1 Formula for Theil Index: $T = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{x_i}{\mu}\right)ln\left(\frac{x_i}{\mu}\right)$

- N= total number of countries in dataset
- x_i = number of medals won by each country
- μ = mean across all countries (average of all the data points)
- $\frac{x_i}{\mu}$ = the ratio of each country's medal count to the average medal count
- $ln\left(\frac{x_i}{\mu}\right)$ = natural logarithm of the aforementioned ratio
- Σ = summation symbol, adding all the squared deviations

3.3.6 IBM SPSS was used to check for statistical significance and support the findings seen in previous table

3.3.6.1 A Bivariate Correlation Table was created to analyse the statistical significance between the primary four key variables that this paper puts specific interest to: Groups (representing HDI tiers as classified by the UNDP), total medals per country, continent, and HDI per country.

3.3.6.2 A One-Sample T Test was conducted to compare the statistical significance and differences between the lowest HDI countries' quartile mean medals and the total mean medals for the entire data set.

3.3.6.3 A One-Sample T Test was conducted to compare the statistical significance and differences between the lowest HDI countries' quartile mean HDI and the total HDI mean for the entire data set.

3.3.6.4 A One-Sample T Test was conducted to compare the statistical significance and differences between the lowest HDI countries quartile mean medals and the specific mean medals won by the "High" HDI countries category as designated by the UNDP.

3.4 Data Visualization

3.4.1 The primary purpose of the Lorenz curve in this study was a method of a visualization and representation

3.4.1.1 The code was written and then submitted into Matlabs to ensure an accurate representation of the data

3.4.1.2 The curve strays away from the 45 degree line thus additionally also acting as another method of analysis and further highlighting and showcasing that inequality is present

3.4.2 Initially, a 2D scatter plot was used to showcase the spread between HDI and medal count; however, as the study progressed and a third primary variable was added – continental origin – a 3D scatter plot became better option

3.4.2.1 The code was written comparing HDI on the X axis, medal count on the Y axis, and continental origin on the Z axis

3.4.2.1.1 For continental origin, as aforementioned under section 2.2.2.1 of 'Data Processing and Organisation', each continent was given a number primarily for ease of plotting in the code**.**

3.4.2.1.2 The 3D scatter plot was edited to show the continents name as the z tick label

3.4.3 Finally, a 3D surface plot was similarly used to represent the spread between HDI, medal count, and continental origin

3.4.3.1 The code was written comparing HDI on the x axis, medal count on the y axis, and continental origin on the z axis

3.4.3.1.1 For continental origin, as previously stated under section 2.2.2.1 of 'Data Processing and Organisation', each continent was given a number primarily for ease of plotting in the code.

3.4.3.1.2 The 3D surface plot was edited to show the continents name as the z tick label

3.4.3.1.3 It was primarily utilised to showcase the data from a different perspective

4. Findings

4.1: HDI and Medal Disparity

Table 1 showcases the relationship between HDI – split into above 800 or 'Very high' and below 800 – and medal percentage. Additionally, table one compares the number of countries in those respective HDI brackets to the global percentage of those same respective HDI brackets. Table 1 attempts to address the first research question '**do countries that have a higher HDI score win more medals than countries with a low HDI score?'** The findings of this table are that medal distribution is to a significant amount affected by a country's HDI score. Specifically, 987 medals accounting for approximately 60.40% of the medals won in the most recent Paris 2024 Paralympics were won by countries with an HDI score above 800, which is considered as per the UNDP (United Nations Development Programme) 'very high'. On the other hand, all other countries that have won medals in the most recent Paris Paralympics only account for 39.60% of the medal count or 647 medals. Although it is true that this could be due to more 'very high' HDI countries being present, this in its own presents a significant inequality of its own, which table one also attempts to address. The number of countries in the 'Very High' HDI bracket in the Paris Paralympics are disproportionately represented as they only account for 35.75% of the countries globally while accounting for 60.40% of the medal count. Similarly, all other countries with an HDI below 800 in the Paris Paralympics represent approximately 64.25% of world countries globally while only accounting for 39.60% of the medal count. These numbers of medal representation plummet even further and the inequality grows even more egregious when China, Brazil, and Ukraine – three relatively lower HDI countries yet high performing countries – are counted with the 'Very High' HDI countries. The representation now becomes, 84.33% of the medals, or 1378 medals for 'Very High' HDI countries including China, Brazil, and Ukraine, and 15.67% of medals, or 256 medals for all other participating countries.

Table 1

Category	Medal %	Number of Countries in the Paralympics	Number of countries globally %
Above 800 HDI	60.40% (987 medals)	50 (60.24%)	35.75% (70 countries)
Below 800 HDI	39.60% (647 medals)	33 (39.76%)	64.25% (123 countries)
Above 800 including China, Brazil and Ukraine	84.33% (1378 medals)	53	N/A
Below 800 excluding China, Brazil, and Ukraine	15.67% (256 medals)	30	N/A

4.2: UNDP Tiers Medal Analysis

Similarly to table 1, table 2 also addresses the relation between HDI and medal count; however, it uses the four official UNDP HDI rank tiers: 'Very High' constituting all scores from 800 and above, 'High' constituting all scores from 700 to 799, 'Medium' constituting all scores from 550 to 699, and finally 'Low' constituting all scores below 500. Table 2 showcases a particularly intriguing aspect of the Paralympics, which is that the 'Low' HDI tier, despite accounting for 18.13% of all countries globally, only accounts for 3.61% of countries in the Paralympics, or 3 countries. Additionally, these 3 countries won an incredibly low 0.67% of medals – failing to account for a single percentage point difference in the entirety of the games. Equally worrying,countries in the 'Medium' HDI brackets, despite accounting for approximately 21.24% of all countries globally, only account for 7.23% of countries in the Paralympics, or 6 countries. These countries won a meagre 3.55% of medals or 58 medals in total. If the 'Medium' HDI countries are taken in congruence with the 'Low' HDI countries, nearly 40% of countries globally would only account for 10.84% of countries in the Paralympics and 4.22% of the total medal count. Table 2 additionally addresses the first Research Question '**do countries that have a higher HDI score win more medals than countries with a low HDI score?',** clearly representing that higher HDI countries do in fact win the vast majority of medals and have a highly disproportionate representation in the Paralympics than they should have ceteris paribus.

Table 2

HDI Rank Tiers	Countries %	Medals	Mean	Percentage Globally
Very High (0.800)	60.24% (50)	60.40% (987 medals)	19.74	35.75% (70 countries)
High (0.7-0.79)	28.92% (24)	35.31% (577 medals)	24.04	23.83% (47 countries)
Medium (0.55-0.69)	7.23% (6)	3.55% (58 medals)	9.67	21.24% (41 countries)
Low (Below 0.55)	3.61% (3)	0.67% (11 medals)	3.67	18.13% (35 countries)

4.3: Previous Host Advantage Comparison to Medals

Regarding the analysis of previous host advantage, table 3 addresses the amount of medals, continental origin, and HDI score of the 15 previous hosts in the Paris Paralympics; thus, addressing both RQ1 (do countries that have a higher HDI score win more medals than countries with a low HDI score?) and RQ2 (to what extent does a country's geographical location or previous host status affect its chances of medal winning?) simultaneously. Table 3 shows that Europe has the highest number of previous hosts (7) and the highest overall number of medals at 428. This is followed by Asia, which has the second highest number of previous hosts (4) and the second highest number of medals at 300. The pattern is then followed by North America at 2 previous hosts, and South America and Oceania each with one previous host respectively. However, table 3 additionally showcases the total number of medals won by all the previous hosts, which stands at 1014 medals or 62.06% of the total medal count. Furthermore, the mean HDI of the fifteen previous hosts is 905.07, for reference the UNDP considers anything above 800 to be 'Very High'. Moreover, globally, there are only 30 nations with an HDI score above or equal to 905.

Table 3

Continent	Medals	Mean HDI	Amount of Previous Hosts	Total Mean HDI	Total Medals
Europe	428	922.3	7	When all 15 countries are added, the mean HDI is 905.07	1014 medals 62.06% of the total medal count
N. America	134	931	2		
Asia	300	888	4		
Oceania	63	946	1		
S. America	89	760	1		

4.4: Continental Origin and Medal Winning

When analysed in conjunction with the previous table, Table 4 further solidifies the relationship between continental origin and medal winning Table 4 however expands on continent specific trends and accentuates the differences present in between different continents. Africa – despite having 10 countries who have won medals –only accounts for a measly 3.92% of the medal count. In addition to that, Africa stands as the only continent without a previous host. Table 4 illustrates that despite Oceania only having two participant nations, they still win more of the medal percentage than Africa. This could be attributed to the fact that Oceania has a previous host (notably Australia), and has a much higher average HDI score than Africa.

This trend is further seen in both South America and North America, as despite them having 8 and 4 countries respectively, they each win significantly more of the medal count than Africa does, with the former winning 9.06% of the medal count and the latter winning 8.20%**.**

Additionally, the findings of table 4, reinforce that Asia and Europe – with a focus on East Asia and Western Europe in specific – win a disproportionate amount of the medals going to them. This inequality is further exacerbated by the fact that the majority of countries that participate from Asia and Europe, especially those that win, tend to be higher HDI countries or previous hosts.

Table 4

Continent	Medal %	Previous Hosts	Number of Countries
Africa	3.92%	0	10
S. America	9.06%	1	8
Oceania	4.41%	1	2
Asia	31.33%	4 (3 East Asia)	24
Europe	43.02%	7 (6 Western Europe)	35
N. America	8.20%	2	4

4.5: Theil Index Analysis

Table 5 presents the results of the Theil Index for the whole data set and for each of the five respective quintiles. The Theil Index is a measure of inequality with the closer the value being to 1 the more unequal the distribution being. The total Theil value for the data set is 0.8469, representing a relatively high distribution of medals throughout the data set. However, table 5 additionally presents the Theil values for each of the 5 quintiles in ascending order, which allows for comparison and identification of different trends in each quintile. The most immediate outlying value is that of Quintile 2 with a value greater than one. This indicates incredibly unequal distribution as it is extremely rare for Theil Index values to be over one and only occur

in extreme situations of inequality. This inequality can be attributed to China's data point of 220 and Brazil's data point of 89 significantly deviating from the rest of the data.

4.5.1 If $T = 0$ then that is perfect equality and if $T = 1$ then extreme inequality, the closer the value is to 1 the more unequal the distribution is. The Theil index is commonly used in income inequality studies because it effectively captures how concentrated a resource is within a population. In this study, instead of measuring income, the Theil index measures the concentration of medals among countries. If a few countries win a disproportionate share of the medals while many countries win few or none, the Theil index will reflect this inequality.

4.5.2 The Theil index is particularly sensitive to situations where a small number of countries have a disproportionately large share of the total resources (medals in this case). The Theil Index's sensitivity arises from the fact that it includes a logarithmic function, which makes it particularly more sensitive to both large and small deviations throughout the data set. Thus allowing it to account for both countries with extremely high medal counts (outliers: China, Brazil, Ukraine) and countries with very low medal counts.This is in contrast to other indices, such as the Gini Coefficient which is less sensitive overall. This makes it particularly useful in the context of the Paralympics, where historically, high-income, European, American, and previous host nations tend to dominate due to better athlete support, infrastructure, and investment in Paralympic sports.

4.5.3 Quintile 5 and 3 additionally stand out due to their significantly lower scores, yet the reason for their differences are widely different. Quintile 3 has a relatively low Theil score due to the majority of the countries winning a similar amount of medals – in this case being relatively little. On the other hand, quintile 5 has a relatively low Theil score due to the medal amounts being relatively similar and high. This additionally supports tables 1 and 2 in addressing RQ1(do countries that have a higher HDI score win more medals than countries with a low HDI score?) and finding that higher HDI countries tend to win more medals than lower HDI countries.

Table 5

Theil Index	
Total Value for data set	0.8469
Quintile 1 (lowest HDI)	0.7212
Quintile 2	1.191
Quintile 3	0.4429
Quintile 4	0.7009
Quintile 5 (highest HDI)	0.5284

4.6: Quintile Mean Medal and HDI Analysis/Comparison

Table 6 presents and primarily compares the means throughout the Paris Paralympics. The total mean for medal stands at 19.69 per country, and the mean HDI stands at 831.27. However, the table additionally disaggregates the data into bottom, middle, and top quintiles – revealing a clear pattern of stratification. The bottom quintile has an overall mean for medals that is almost 7 medals lower than the total mean, and an HDI score lower by nearly 173 points. A more glaring disparity arises when the bottom quintile is compared to the top quintile; the medal gap rises from 7 to over a 19 medal difference.

Additionally, the HDI score difference increases from 173 points to a nearly 289 point gap. Furthermore, the most peculiar thing the table showcases is that the middle quintile, despite having a higher HDI score (176.8 points) than the bottom quintile, has the lowest overall medal mean (8.35 medals). Table 6 perfectly addresses and showcases the effects of both RQ1(do countries that have a higher HDI score win more medals than countries with a low HDI score?) and RQ2 (to what extent does a country's geographical location or previous host status affect its chances of medal winning?). Firstly, It addresses RQ1 by tabularising and comparing the effect of medals and HDI and showcasing general trends and correlation between the two that can be supported by tables 1,2, 3 and 7. Yet, it is what raises RQ2 and suggests that there must be another factor affecting medal distribution. This variability could be attributed to two other factors that this study addresses:continental origin and previous host advantage; thus addressing RQ2.

Table 6

	Medals	HDI
Mean	19.69	831.27
Mean for bottom Quintile	12.77	657.80
Mean for middle quintile	8.35	834.60
Mean for top quintile	31.82	946.3
SD	5.764	110

4.7: Para Equestrian Analysis

Table 7 is a specific example from one of the Paralympic categories – Para Equestrian. This specific category is regarded as the most expensive by far, and thus, this table not only addresses RQ1 (do countries that have a higher HDI score win more medals than countries with a low HDI score?) but also RQ2 (to what extent does a country's geographical location or previous host status affect its chances of medal winning?). Table 7 shows that the entirety of the medals in para equestrian were by either European or American nations, with the divide being 78.79% European and 21.21% won by the United States.

This addresses RQ2 by providing further evidence that countries originating from the European continent or the North American continent tend to win more medals especially in more expensive sports such as para equestrian. Moreover, Table 7 presents the Mean HDI for both, displaying that the mean HDI for European nations was 930.71 and for the United States it was 927, far above the overall mean for the paralympic nations presented in table 6 of 831.27. The trends in para equestrian are exacerbated by the fact that it is the most expensive paralympic sport, thus requiring more investment and undermining the ability of poorer countries to participate despite them having an overall larger share of the disabled population.

Table 7

Para Equestrian Breakup		
Continent	Medals	Mean HDI
Europe	26	930.71
United States	7	927

4.8: IBM SPSS Correlation Table Analysis

The correlation matrix conducted in IBM SPSS provides a statistical analysis that showcases the relationship between four key variables that this paper puts specific interest to: Groups (representing HDI tiers as classified by the UNDP), total medals per country, continent, and HDI per country. The analysis is primarily that of Pearson correlation coefficient (r) and a two-tailed significance value represented by p. This table addresses both RQ1 (do countries that have a higher HDI score win more medals than countries with a low HDI score?) and RQ2 (to what extent does a country's geographical location or previous host status affect its chances of medal winning?), and supports all previous tables in proving that the findings are statistically significant.

4.8.1: The most striking finding is the exceptionally strong positive correlation between HDI tiers and a country's HDI which gained a p value of 0.001 and $r = 0.914$ -- suggesting that higher HDI countries are overwhelmingly concentrated in top medal quartiles.

4.8.2: Furthermore, a moderately strong correlation is seen between HDI tiers and Continent -- $r = 0.585$ and $p < 0.001$ -- that indicates that higher medal quartiles are dominated by specific continents (in this case Europe, N. America, and Asia for the most part). This is supported by previously aforementioned tables (specifically tables 7, 4, and 3).

4.8.3: Interestingly however, the analysis does not find any significant correlation between neither total medals per country and continent ($r = 0.096$, $p = 0.387$) nor country specific HDI ($r = 0.145$, $p = 0.192$).

This suggests that raw medal counts fail to show a clear pattern without stratification (dividing into quartiles/quintiles/etc). This lack of correlation could be attributed to significant outliers such as China, Brazil, or Ukraine, which skew the data.

4.8.4: Finally, there is another significant correlation seen between continent and country specific HDI ($r = 0.612$, $p < 0.001$). This further confirms that developmental advantages are geographically concentrated, which is moreover supported by previous tables.

Table 8

Correlations

		Groups	Total Medals Per Country	Continent	Country Specific HDI
Groups	Pearson Correlation	1	.074	.585**	.914**
	Sig. (2-tailed)		.505	<.001	<.001
	N	83	83	83	83
Total Medals Per Country	Pearson Correlation	.074	1	.096	.145
	Sig. (2-tailed)	.505		.387	.192
	N	83	83	83	83
Continent	Pearson Correlation	.585**	.096	1	.612**
	Sig. (2-tailed)	<.001	.387		<.001
	N	83	83	83	83
Country Specific HDI	Pearson Correlation	.914**	.145	.612**	1
	Sig. (2-tailed)	<.001	.192	<.001	
	N	83	83	83	83

**. Correlation is significant at the 0.01 level (2-tailed).

4.9: Statistical Significance (Medals Gathered by Low HDI Countries vs Total Data Mean)
Table 9 showcases the results of a One-Sample T Test conducted in IBM SPSS that compares Q1M (representing the lowest quartile medals as denoted by the UNDP, see table 2) against that of the total data set (19.69 medals). Table 9 addresses RQ1 (do countries that have a higher HDI score win more medals than countries with a low HDI score?) through showing that there is a statistically significant difference between the lowest quartile medals and the overall medals mean. The extremely negative T-value of -9.804 with 2 degrees of freedom indicates that the "Q1M" or Low HDI countries' quartile medals mean is much lower than the overall mean of the data set. This is further supported by both the one-sided p value of .006 and the two-sided p of .012.The mean difference of -16.02 medals shows that the Low HDI countries won, on average 16 medals fewer than the total mean. This is coupled with a 95% confidence degree; agreeing with previous tables that the poorest-performing nations consistently underperform.

Table 9

One-Sample Test

Test Value = 19.69

	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
Q1M	-9.084	2	.006	.012	-16.02333	-23.6125	-8.4342

4.10: Statistical Significance (HDI Mean of "Low" Countries vs Total Data Mean)

Table 10 showcases the results of a One-Sample T Test conducted in IBM SPSS that compares Q1 (representing the lowest quartile HDI as denoted by the UNDP, see table 2) against that of the total data set (831.27). The T-value of -17.419 with 2 degrees of freedom indicates that the "Q1" or Low HDI countries' quartile mean is much lower than the overall mean of the data set. This is further supported by both the one-sided p value of .002 and the two-sided p of .003.The mean difference of -304.60 HDI points shows that the Low HDI countries, on average, are approximately 305 HDI points fewer than the total mean of the data set. This is coupled with a 95% confidence interval; agreeing with previous tables that the poorest-performing nations have substantially lower development levels compared to the Paralympic average.

Table 10

One-Sample Test

Test Value = 831.27

	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
Q1	-17.419	2	.002	.003	-304.60333	-379.8417	-229.3650

4.11: Statistical Significance (Medals Gathered by Low HDI Countries vs High HDI Mean)

Table 11 showcases the results of a One-Sample T Test conducted in IBM SPSS that compares Q1M (representing the lowest quartile medals as denoted by the UNDP, see table 2) against that of the High HDI countries (second highest quartile) mean amount of medals (24.04 medals). Table 11 addresses RQ1 (do countries that have a higher HDI score win more medals than countries with a low HDI score?) by showing that there is a statistically significant difference between the lowest quartile medals and the medals mean won by the "High" countries category. The high negative T-value of -11.551 with 2 degrees of freedom indicates that the "Q1M" or Low HDI countries' quartile medals mean is drastically lower than the specific mean of the High HDI countries quartile. This is further supported by both the one-sided p value of .004 and the two-sided p of .007. The mean difference of -20.37 medals shows that the Low HDI countries won, on average 20 medals fewer than the mean compared. This is coupled with a 95%

confidence level that moreover helps in answering RQ1 through proving that Low HDI countries have an even wider range against the second highest quartile average.

Table 11

One-Sample Test

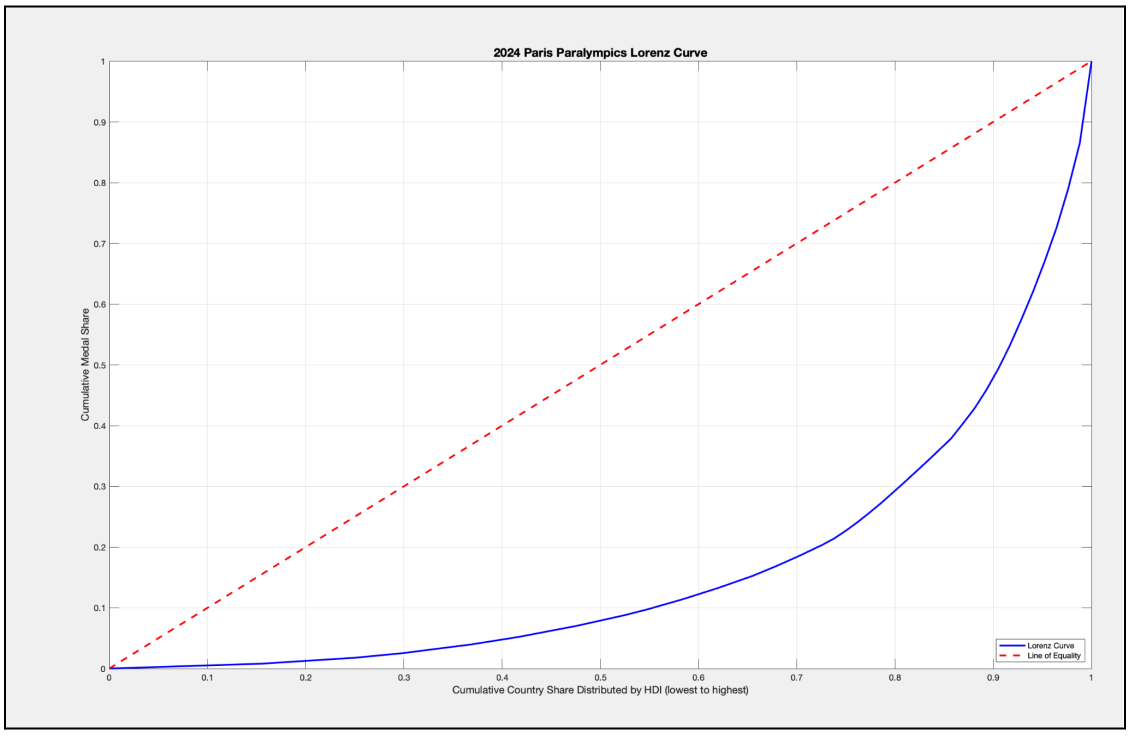
Test Value = 24.04

	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
Q1M	-11.551	2	.004	.007	-20.37333	-27.9625	-12.7842

4.12: Lorenz Curve Explanation

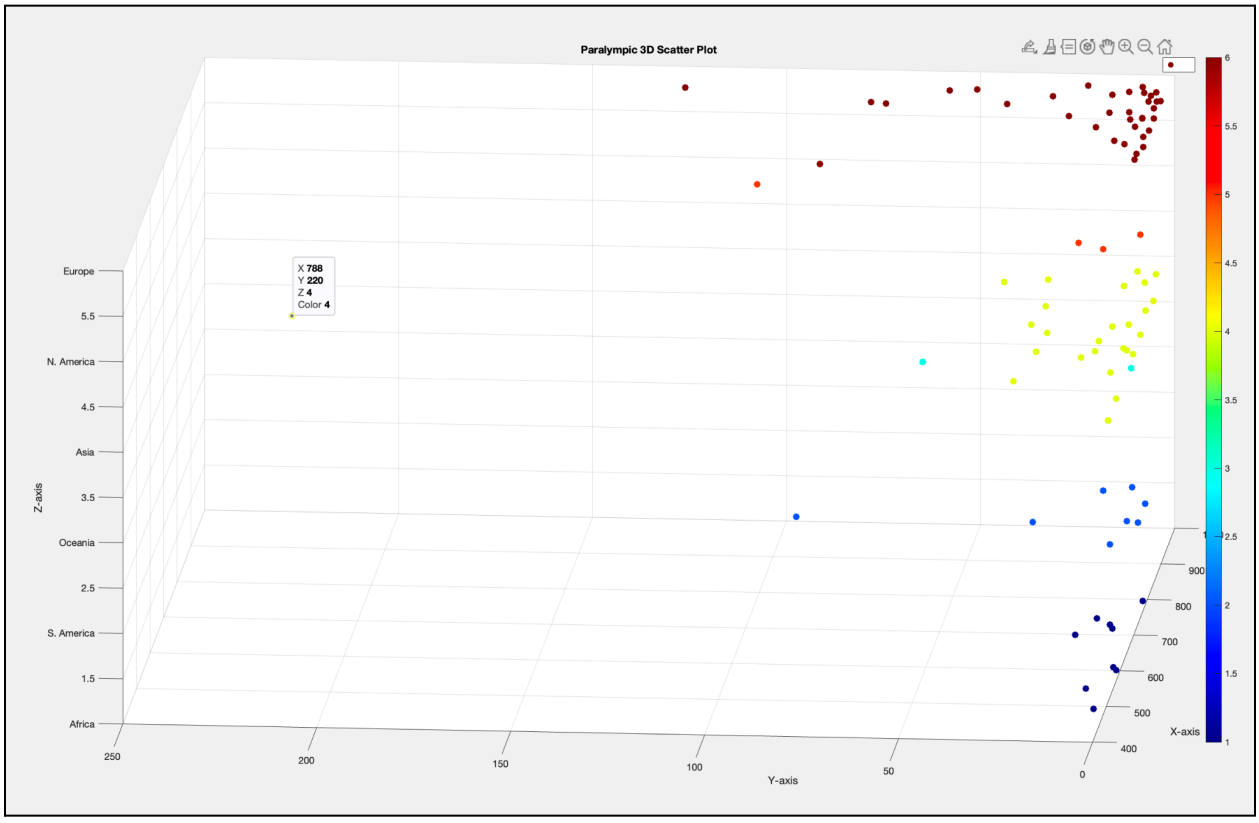
The first graph is a lorenz curve of the cumulative medal distribution ranked in order of HDI. It acts as a visual representation showcasing the deviation from the 45 degree line, and thus supporting tables 1, 2, 3 and 7 in addressing RQ1(do countries that have a higher HDI score win more medals than countries with a low HDI score?). Additionally, a lorenz curve attempts to showcase inequality in terms of how far the data set (the blue line) deviates from the 45 degree line, the greater the deviation the greater the inequality and concentration of medals in higher HDI countries. In this case, the curve significantly deviates from the 45 degree line, indicating that there is significant concentration in higher HDI countries. This can be supported by the total Theil index figure of 0.8469, which supports the hypothesis that there is significant inequality and concentration.

Graph 1 (Lorenz Curve)

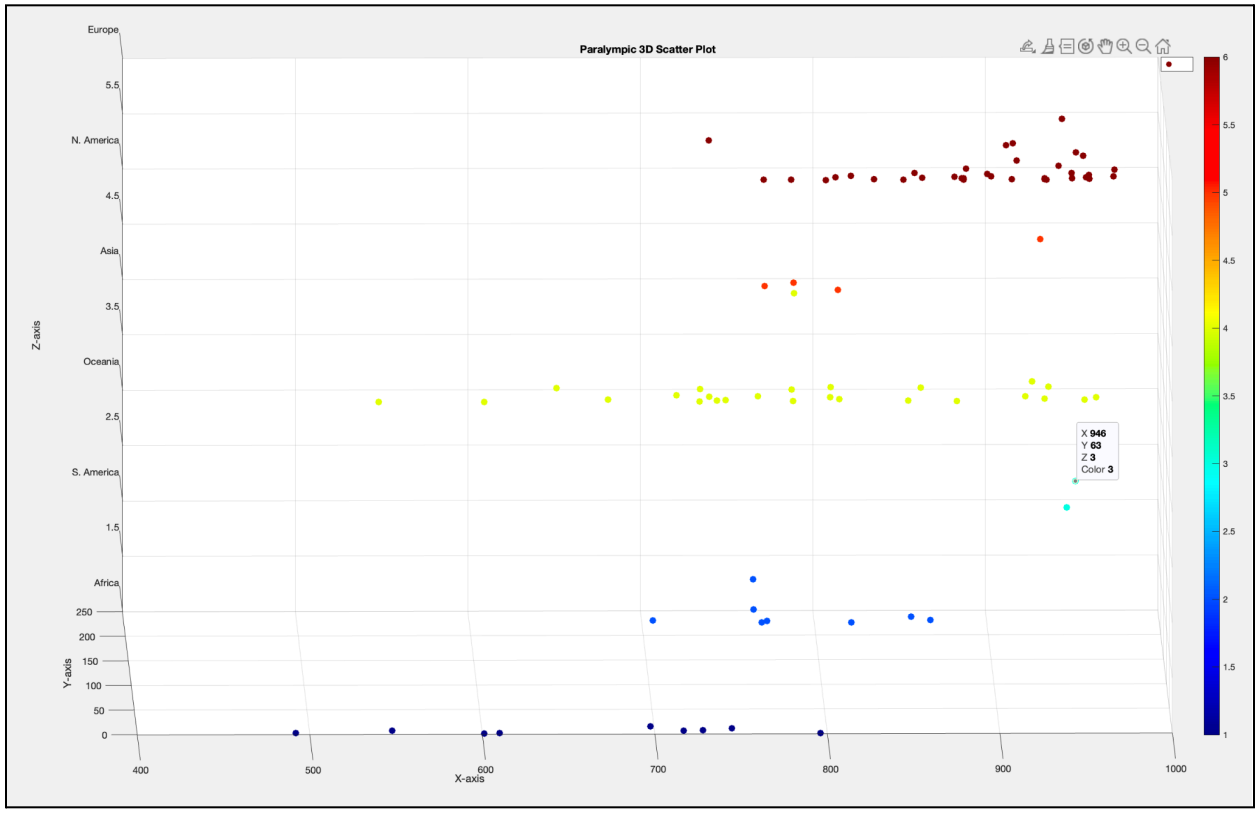


4.13: 3D Scatter Plot Analysis

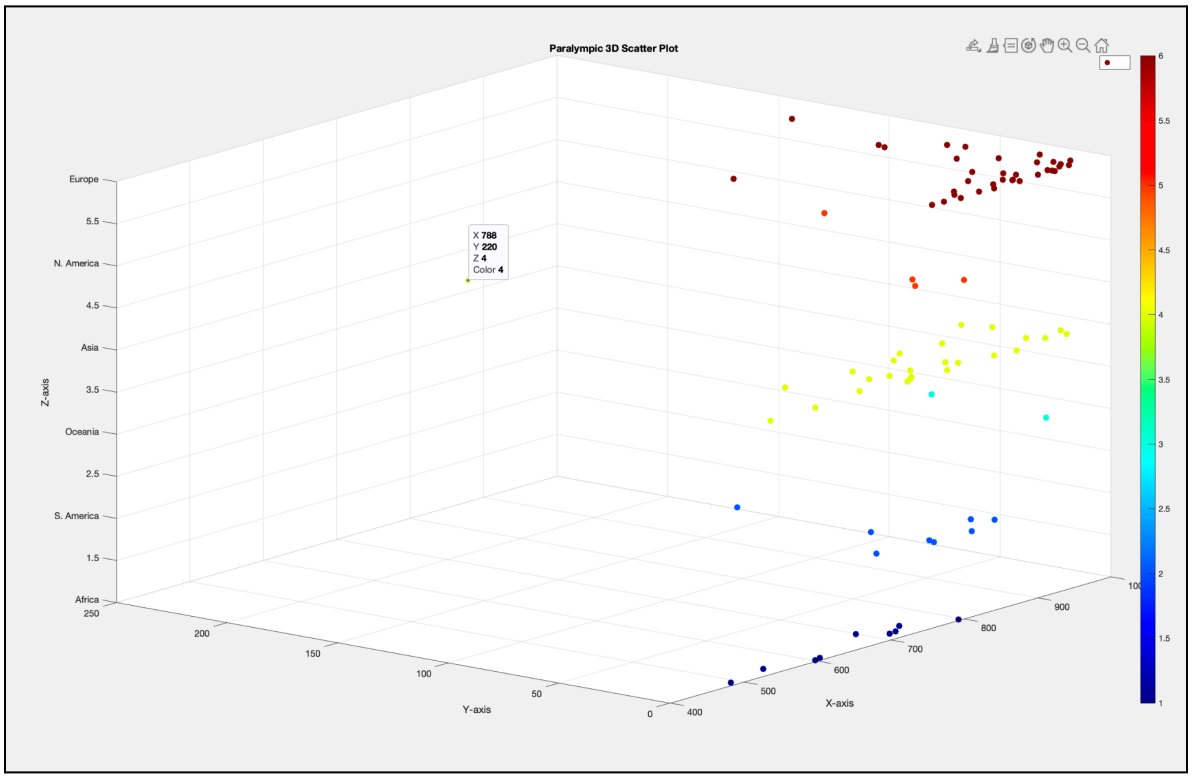
Graph 2 visualizes the data that addresses both RQ1 (do countries that have a higher HDI score win more medals than countries with a low HDI score?) and RQ2 (to what extent does a country's geographical location or previous host status affect its chances of medal winning?) through showcasing a detailed breakdown and plotting of countries against 3 axes (medal count on Y axis, HDI on X axis, continental origin on Z axis) in a scatter plot format. Graph 2 evidently shows a concentration of high HDI, European countries (seen in dark red) with significantly more medals than all other countries of different origins. Additionally, the image of Graph 2 with a focus on the Y axis highlights the specific data point of China with an HDI of 788, medal count of 220, and Z axis 4 correlating to Asia. China is clearly an outlier notably deviating from the rest of the Asian continent. Furthermore, Graph 2 illustrates Brazil as another outlier in the South American continent (seen in light blue) substantially deviating from the rest of the South American. On the other hand, Ukraine can not be immediately seen as outlying from the European continent if seen from the perspective with a focus on the Y axis; however, when the perspective is focused on the X axis, it is more visible as it has the lowest HDI, thus being the first country in deep red plotted against the X axis. Moreover, the graph that focuses on the X axis illustrates a clear break between the 800 HDI mark which contains the vast majority of African and South American nations, along with a significant portion of Asian countries.
Graph 2 with the focus on the X axis highlights the data point of Australia as reference with an HDI of 946, medal count of 63, and Z axis of 3 correlating to Oceania.
Graph 2 (Focus on Y axis)



Graph 2 (Focus on X axis)



Graph 2 (General View)



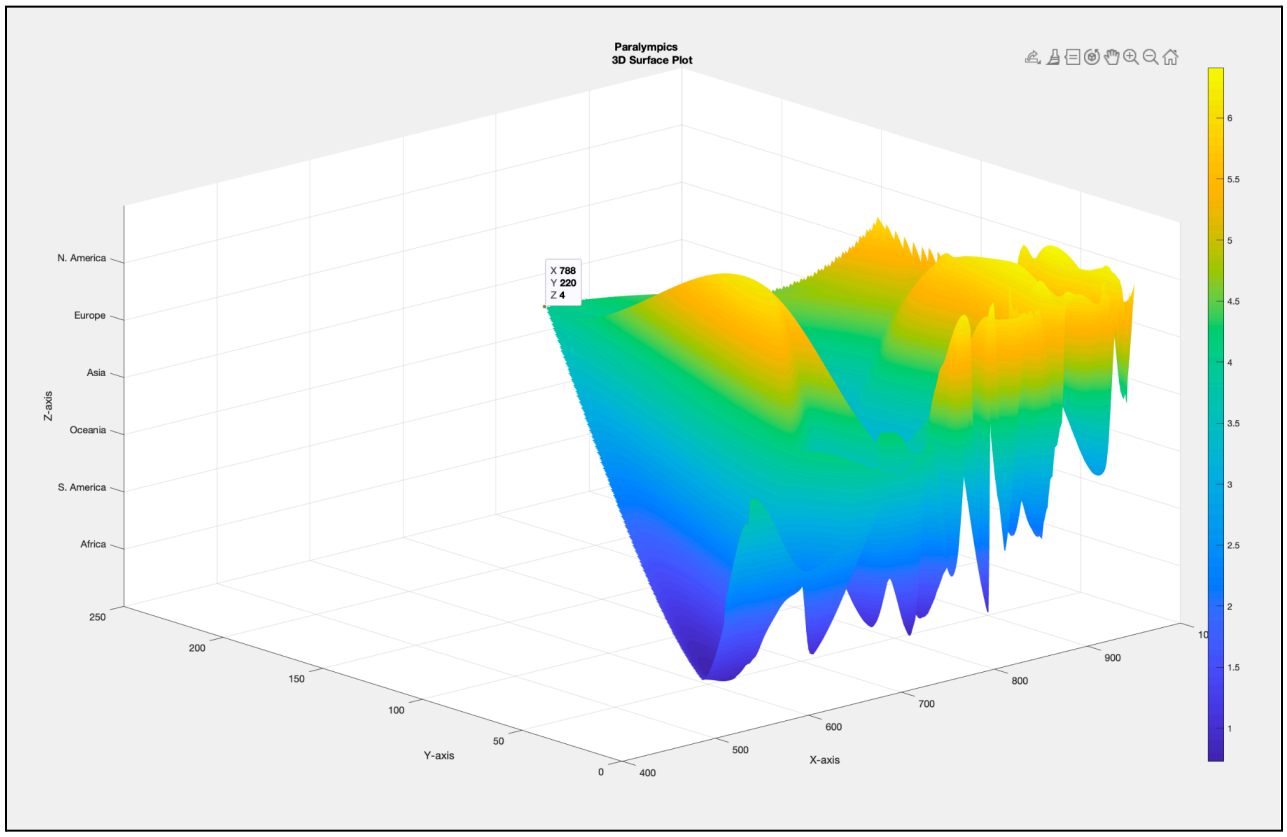
4.14: Differences Between Scatter Plots and Surface Plots

Surface plots differ from scatter plots and line graphs in the sense that they provide a continuous representation of the data, allowing for more intuitive analysis of how two variables interact to influence a dependent variable (medals in this case). Graph 3 (3D Surface Plot) is a surface plot analyzing the interaction between Human Development Index (HDI) on the X axis, medal count on the Y axis, and continental origin on the Z axis. It contrasts significantly from Graph 2 (3D scatter plot) – which portrays isolated data points – as Graph 3 reveals, primarily, through changes in gradients, peaks, inclines, and declines, showcasing trends and inequalities in a significantly more intuitive and clear way.

4.15: 3D Surface Plot Analysis

Graph 3 showcases the relationship between HDI (X axis) and continental origin (Z axis). In comparison to Graph 2, Graph 3 clearly shows a significant plateau in yellow (Europe) near the 900 HDI mark. Additionally, this plateau coincides with a significant medal correlation (approximately 50 ≈), visualising the relation between Europe's significantly higher HDI scores with a corresponding amount of the medal count. Furthermore, the entire plane from 5 - 6 (muddy yellow to dark yellow) consisting of North American and European Nations has nearly the entirety of all peaks and plateaus, which generally tend to correlate with high amounts of medals. This can be attributed to their significant Human Development Index scores, and the fact that the vast majority of previous hosts tend to originate from the North American and European continents. Contrastingly, in dark blue (Africa) and light blue (South America) a significant amount of sharp declines and valleys can be seen which often correlate to very little of the medal count. This can be attributed to a significant lack of previous hosts and low HDI scores. Moreover, the surface plot showcases that the effect of outliers (such as China seen with an X axis of 788, Y axis of 220, and Z axis of 4) do affect the overall distribution however their effect is not extreme. The Asian continent in green appears to be in the middle with a mix of valleys and some low peaks. Graph 3, similarly to Graph 2 addresses both RQ1(do countries that have a higher HDI score win more medals than countries with a low HDI score?) and RQ2 (to what extent does a country's geographical location or previous host status affect its chances of medal winning?) through the plotting of all countries against three axes.

Graph 3 (Surface plot)



5. Limitations

5.1 This study has important limitations that must be addressed before the data is discussed. Firstly, and arguably most importantly, the data for this study was only collected from the most recent Paris 2024 Paralympics. This, although insightful, lacks to take into account previous paralympics, which may have a different makeup that may have higher/lower inequality based on HDI and continental origin. Longitudinal analysis of multiple Paralympic games across different time periods, or even all paralympic games would certainly prove useful. A longitudinal analysis would not only (in all likelihood) solidify and prove the effect that socioeconomic factors have, but it would also allow us to see how disparities and inequalities change across different time periods in various host countries. Furthermore, it would also showcase the effect of important historical events such as but not limited to: changes in Paralympic classification, global recessions (2008, Asian financial crisis, 1990s recession, etc), or even the host city. Due to this study's primary focus on HDI, continental origin, and previous host advantage; this limits the scope of the research and fails to address other possible hidden factors. These factors could include investment in Paralympic training programs, governmental funding structures, athlete classification systems, and cultural attitudes toward disability sports.

5.2 Another key limitation is the exclusion of longitudinal analysis. While the Paris 2024 Paralympics offer a contemporary snapshot, examining trends across multiple Paralympic Games would provide a more comprehensive understanding of how disparities evolve over time. The impact of historical events, such as changes in Paralympic classification regulations or shifts in global economic conditions, could play a crucial role in shaping medal outcomes but remain unexplored in this study.

6. Discussion

6.1: Goal issue:

The findings reveal that representatives of athletes with disabilities have minimal attention from the media, even with the high popularity increase of the Paralympics. This highlights the public cluelessness into making a huge gap between the right amount of recognition the disabled athletes receive, as it is mentioned in the introduction. Recent research studies (26) have suggested that the mainstream media representation of disabled athletes increasingly fits within the "standard" of sports reporting. It should be noted that the importance and popularity of the Paralympic Games are at a different level when compared with competitive disability sports events in general. The lack of coverage and stereotypical representations can be identified from the cultural attributions made by the media. This kind of commentary made arguments for journalism to take professionalism seriously, in a way for showcasing the Paralympics in the media by these reasons:

6.1.2 The Paralympics are an elite-level, international sporting event and thus merit sport-focused coverage.
6.1.3 Sport journalists have an ethical obligation to include diverse perspectives in reporting and to challenge stereotypes.
6.1.4 Sport is intertwined with social issues and requires contextualized reporting. The commentary concludes with recommendations for sport communication and journalism education.

6.1.5 The creation of trophies and medals began in 1948, arose for Para athletes at the Stoke Mandeville Games. There was a maximum peak of the number of types of medals from 1996 to 2000s, but later made an unexpected decrease in 2008. But soon after an increase of medals started to form again. Some factors were affecting such as the large size effect when comparing PG to the recent events in the Olympics. The number of medals can influence the athlete's performance (either in a good way or a bad way). Yet with the increasing number of participants from countries with such great investment, explains how these indicators happen.
During the first tryouts of the Summer Paralympics (from 1960 to 1984), there was an increase in the number of medals (from 113 to 975), which was mainly caused by the increased number of sports events. Eventually, there was a decrease in the number of medals between 1984 and 1992(from 975 to 489) that was caused by a decrease in the number of sports events. Currently,

in today's Paralympic games, the number of medals is currently from 5084 to 549 medals in the 2024 Summer Paralympics.
After this stage of declination, it was finally neutralized. This number of medals remained stable, despite a slight increase in classes, especially with some sports being combined in the same events as other sports. Thus excluding certain other sporting events.

6.1.6 Past research (25) has found empirical evidence of how the socio-economic factors affect the country's performance in a certain way. Using panel data from the 1960 to 1996 Summer Olympic Games, an argument came about the distribution of medals due to the high population of the country. Countries with a large population and high investments find themselves in the position of being able to participate in these games and have a higher chance of winning.

6.2: Paralympic athletes often struggle financially

6.2.1 In recent years, a growing number of elite-level athletes have spoken out about how hard it is to afford their general living expenses while they train to compete at the highest level. Former competitors have shared their experiences applying for food stamps and living close to the poverty line. A 2020 survey by Global Athlete found that of nearly 500 athletes across 48 countries, including current and former Olympians and Paralympians, 58% did not consider themselves financially stable; some said that the only way they can make their rent is "to sell possessions on eBay," while others said that their parents still have to help them pay for their food.

6.2.2 The research outcomes have thrown up various surprises as regards the Paralympic performance and relationship with the Human Development Index (HDI). The expected patterns, that those nations with the highest HDI turn out to have the strongest representation in the Paralympic medal table owing to the substantial resources and infrastructure, have not been lived out. Such cases of high disproportionate medal rewards to countries with lower HDI such as Brazil and Kenya strike an immediate challenge to the traditional assumption that economic affluence is the main path to success in Paralympic sports. One unexpected pattern was that countries not well endowed did very well, pointing to the fact that besides resourcefulness, factors such as community-driven sports for the disabled, cultural attitudes towards disability, and athlete resilience also play key roles in outcome determination. This suggests that nations with lower HDI might have come up with some unique or local models that can successfully nurture Paralympic talent. Such findings heighten the need to delve into further socio-cultural and systemic factors that could intervene in the attainment of success in the Paralympic space, which goes beyond the tradition of HDI and economic development

6.2.3

Sports Category	*Sports*	*Cost*
Para-athletics	Throwing frames	$2K
	Racing wheelchairs	$12K to $15K
	Running blades	$4,5K (Basic blades) and $25K (Advanced blades)
Para-cycling	Handcycles	$25K
	Tandem bikes	$20K
	Tricycle	$5K
Bocia	Ball and Ramps	$2,6K and $5K (Propel the balls)
	Goalball	From $5,050 to $5,1K
	Para swimming	$25,100 to $50,100
	Wheelchair sports (basketball, rugby, and tennis)	$5K to $15K for specialized wheelchairs
Canoe	Para canoe	$1K
Equestrian	Para equestrian	$5K
Volleyball	Sitting volleyball	Depends on the requirements and other mandatory tools needed
Rowing	Para rowing	$5K (additional $1K for custom seat)
Visually impaired athletics	Goalball, blind running, etc	$5K ($50 to $100 for eyeshades)

6.2.4 “While the Olympic Games are always under the spotlight, the Paralympic Games are somehow ignored, despite the fact that para-athletes are very inspiring in the sense that they have to overcome their physical or mental disability to compete in sports events. Some athletes with disability hope to change how society views disability, but still, the governments, the general public and even the journalists are lagging.

This discourages para-athletes to let people know more about the disabled athletes and the Paralympic Games is the motivation behind this paper. Publishing a research article in a refereed journal may induce readers to think about these para-athletes and the differential treatments they received." (29)

7. Recommendations

7.1 This study's findings showcase significant disparities in Paralympic medal distribution, and that medal winning is associated and correlated with external factors outside of the athletes' control. This is not to undermine or underscore the amount of effort and dedication that these athletes put into their respective sports, as it is exceptional. This is to say, however, that the playing field is not inherently equal, and structural factors such as economic development, geographical origin, and prior host status heavily influence medal distribution.

7.2 To address these struggles and hurdles, global investment in Paralympic infrastructure should be expanded, particularly in lower-HDI nations where athletes face severe resource limitations that often restrict them. The International Paralympic Committee (IPC) and other governing bodies should implement targeted funding programs to support training centers, coaching initiatives, and athlete development pathways in underrepresented regions, in particular, African, South American, and Asian nations that are not previous hosts and have relatively low HDI. Additionally, the exorbitantly high cost of adaptive sports equipment remains a major barrier to participation in all nations worldwide. Significant strides and efforts must be taken in order to decrease the cost and increase accessibility to all disabled people worldwide to participate in sports that require adaptive equipment. Establishing subsidized procurement programs and a global redistribution initiative—where high-performance but retired equipment is repurposed—would significantly enhance accessibility for athletes in resource-limited settings.

7.3 Furthermore, the study highlights the significance of "previous host advantage," athlete exchange programs could be utilised to mitigate this effect. By having athletes from disadvantaged nations train in nations that benefit from the previous host advantage, an exchange of resources, knowledge, and training expertise would be utilised.

7.4 Beyond financial and structural disparities, media representation plays a crucial role in sports worldwide, which the Paralympics struggle to utilize fully. The Paralympics often suffer from limited coverage and sponsorship opportunities, thus decreasing public engagement, and further disadvantaging athletes from underrepresented regions. Unlike the Olympics, which dominate global sports coverage, the Paralympics remain on the periphery of mainstream media, hindering the ability of Paralympic athletes to capture the exposure they deserve.
The Paralympics would benefit significantly from increased media visibility, which would in turn increase sponsorship opportunities and public engagement.

7.5 Finally, future research should take a longitudinal approach, analyzing multiple Paralympic cycles to track and compare the transformation of disparities and assess the effectiveness of policy interventions. Additionally, the scope of analysis should be expanded to include national disability policies, government funding schemes, and other initiatives that may help Paralympic athletes. This would provide deeper analysis and insights into what influences medal outcomes, ergo increasing the effectiveness of policies that could help. This study further found that medals have a CV (coefficient of variation) score of 1.698, which could be utilized by future studies for comparison.

Supplementary Materials

Detailed Previous Host Breakup			
China	220	Asia (East)	788
United Kingdom	124	Europe (Western)	940
United States	105	N. America	927
Brazil	89	S. America	760
France	75	Europe (Western)	910
Italy	71	Europe (Western)	906
Australia	63	Oceania	946
Netherlands	56	Europe (Western)	946
Germany	49	Europe (Western)	950
Japan	41	Asia (East)	920
Spain	40	Europe (Western)	911
South Korea	30	Asia (East)	929
Canada	29	N. America	935
Greece	13	Europe (Southern)	893
Israel	10	Asia	915

Detailed Para Equestrian Breakup		
Countries	Medals	HDI Score
United States	7	927
Netherlands	6	946
Belgium	2	942
Latvia	2	879
Germany	6	950
Great Britain	7	940
Italy	2	906
Denmark	1	952

Continental Origin and Previous Hosts

Paralympic Advance Graphs

Paralympic Countries Order

Sources

1. *ASEAN Para-Games to feature 12 sports*. International Paralympic Committee. (2013, May 14). https://www.paralympic.org/news/asean-para-games-feature-12-sports
2. Bureau, U. C. (2021, October 8). *Theil index*. Census.gov. https://www.census.gov/topics/income-poverty/income-inequality/about/metrics/theil-index.html#:~:text=The%20Theil%20index%20measures%20an,%22ideal%22%20of%20maximum%20disorder.
3. Camero, K. (2024, August 30). *It shouldn't be this expensive to be a paralympic athlete*. SELF. https://www.self.com/story/paralympics-costs#:~:text=Unique%20equipment%20and%20travel%20needs,people%20from%20entering%20parasports%20altogether.
4. Funk, A. (2022, July 2). *The pay-to-win problem in Adaptive Sports*. Medium. https://medium.com/counterarts/the-pay-to-win-problem-in-adaptive-sports-8e233cec464
5. Governing. (2021, July 14). *The equipment our disabled athletes need*. Governing. https://www.governing.com/now/the-equipment-our-disabled-athletes-need

6. Hargrave, M. (n.d.). *Standard deviation formula and uses vs. variance*. Investopedia. https://www.investopedia.com/terms/s/standarddeviation.asp#:~:text=Standard%20deviation%20describes%20how%20dispersed,whether%20they%20are%20spread%20out.
7. *Human development index data tracker*. Qery. (2025, February 2). https://qery.no/undp-human-development-index/
8. *IBM SPSS software*. IBM. (2024, September 4). https://www.ibm.com/spss
9. Institute, A. A. (2022, October 17). *Cost of assistive technology as a barrier to inclusion through sport*. Ideas in ALL. https://www.ideasinall.com/cost-of-assistive-technology-as-a-barrier-to-inclusion-through-sport/
10. (IPC), I. P. C. (n.d.). Hira. https://db.ipc-services.org/hira/results-books
11. IRWIN, P. (2024, September 8). *Ukraine's Paralympics Success "a win for Ukrainian disabled people's rights."* barrons. https://www.barrons.com/news/ukraine-s-paralympics-success-a-win-for-ukrainian-disabled-people-s-rights-d54efd12
12. Jacinto, M., Monteiro, D., Matos, R., & Antunes, R. (2022, July 12). *Gold Medals, silver medals, bronze medals, and total medals: An analysis of summer Paralympic Games from 1992 to 2016*. MDPI. https://www.mdpi.com/2227-9032/10/7/1289
13. J;, B. J. L. (n.d.). *Troubling stereotypes: South African elite disability athletes and the paradox of (self-)representation*. Journal of community psychology. https://pubmed.ncbi.nlm.nih.gov/30645001/
14. J-Stage Home. (n.d.-a). https://www.jstage.jst.go.jp/article/jusokenronbun/41/0/41_1311/_pdf
15. Kazazi, M. (2024, June 5). *Hidden hurdles: Understanding the financial challenges of Paralympic athletes*. The Sports Financial Literacy Academy. https://moneysmartathlete.com/the-financial-struggles-of-paralympic-athletes/hidden-hurdles-paralympic-athletes/#:~:text=Athletes%20who%20require%20multiple%20types,training%20camps%2C%20and%20qualification%20events.
16. Lab, G. D. (n.d.). *Subnational HDI (V8.1)*. Global Data Lab. https://globaldatalab.org/shdi/table/shdi/XKO/
17. login, M. (n.d.). *MATLAB LOGIN: Matlab & Simulink*. MATLAB Login | MATLAB & Simulink. https://matlab.mathworks.com/
18. *List of paralympic host cities*. Architecture of the Games. (n.d.-a). https://architectureofthegames.net/list-of-paralympic-host-cities/
19. Nations, U. (n.d.). *Country insights*. Human Development Reports. https://hdr.undp.org/data-center/country-insights#/ranks
20. Para Athletics - Paris 2024. (n.d.-a). https://www.olympics.com/en/paris-2024/paralympic-games/sports/para-athletics
21. *Paris 2024 medals*. International Paralympic Committee. (n.d.). https://www.paralympic.org/paris-2024/results

22. Paris 2024 olympic medal table - gold, silver & bronze. (n.d.-c). https://www.olympics.com/en/olympic-games/paris-2024/medals
23. Ravichandiran, S. (n.d.). *Hands-on meta learning with python*. O'Reilly Online Learning. https://www.oreilly.com/library/view/hands-on-meta-learning/9781789534207/1fe73dd2-546b-48b8-baf0-46a77a239ca5.xhtml
24. Swartz, L., Bantjes, J., Rall, D., Ferreira, S., Blauwet, C., & Derman, W. (2016, December 12). *"A more equitable society": The politics of global fairness in paralympic sport*. PloS one. https://pmc.ncbi.nlm.nih.gov/articles/PMC5152818/#sec001
25. The high costs of participating in adaptive sports. (n.d.). https://www.challengedathletes.org/wp-content/uploads/2019/04/Cost-of-Equipment.pdf
26. Thibault, H. (2024, August 28). *Paris 2024: Why China wins every Paralympic Games*. Le Monde.fr. https://www.lemonde.fr/en/sports/article/2024/08/28/paris-2024-why-china-wins-every-paralympic-games_6722581_9.html#:~:text=From%20spotting%20future%20talent%20to,country's%20success%20at%20the%20Olympics.&text=The%20suspense%20is%20almost%20non%2Dexistent.
27. Thompson, R. (2024, July 5). *Did you know? the significant costs of Para Sport*. Canadian Paralympic Committee. https://paralympic.ca/news/did-you-know-the-significant-costs-of-para-sport/
28. *Who wins the paralympic medals? an analysis of the socio-economic determinants*. Journal of Asian Business and Economic Studies. (n.d.). https://www.emerald.com/insight/content/doi/10.1108/jabes-01-2022-0020/full/html