## The Great Coach Effect

To investigate the Great Coach Effect, we searched for several outstanding coaches and examined the award records of the teams they led in the dataset as evidence.

1. Anna Tarrés: Formerly a rhythmic swimming coach for Spain, she led the team to a silver medal at the 2008 Olympics. In 2012, she left Spain and after several years of moving around, she eventually came to China. In 2024, the Chinese team won its first gold medal in rhythmic swimming, while Spain only managed a bronze this time.

2. Hugues Obry: Once a fencing coach for France, he led the team to a gold medal in 2016. In the same year, he became a coach in China, and under his training, Yiwen Sun, who had won a silver medal in 2016, went on to claim the gold in 2021.

3. BLIZNYUK Anastasia: A former gold medalist in rhythmic gymnastics for Russia, she became a coach for China in 2022. In 2024, the Chinese rhythmic gymnastics team won its first-ever gold medal, having not won any medals in the Olympic Games between 2012 and 2021.

4. Lang Ping: Lang Ping has been the head coach of the Chinese women's volleyball team for many years, leading the team to win a silver medal at the 1996 Atlanta Olympics. She also coached the U.S. women's volleyball team, helping them secure a silver medal at the 2008 Beijing Olympics. At the 2016 Rio Olympics, Lang Ping once again took up the position of head coach for the Chinese women's volleyball team, leading the squad to a strong comeback in the knockout stages despite poor performances in the group stage, and winning the Olympic gold medal.

Each such excellent coach has a high probability of ensuring that the participating teams win at least one gold medal in the next Olympic Games, and if a coach leads multiple athletes in a competition, it is possible for them to achieve both a gold medal and a silver medal.

Selecting three countries for this purpose:

1. Spain: They can rehire the coach of rhythmic swimming.

2. China: particularly the women's team, has achieved significant success; however, the men's team has not yet achieved major results, and the women's team has shown some decline recently.

3. Germany: With its rich history of winning gold and silver medals, now either wins no medals or bronze medals. It needs to hire excellent coaches to revitalize its performance.

### The significance of great coaches:

1. Systematic improvement: Outstanding coaches focus not only on enhancing the current team's performance but also on establishing and perfecting training systems, nurturing young talent, and improving technical facilities. These efforts lay a solid foundation for multiple future competitions, thereby increasing the chances of sustained success.

2. Strategic planning: Top-tier coaches excel at formulating long-term development strategies, including optimizing preparation cycles, reasonably scheduling competition calendars, and addressing competitive pressures at different stages. This helps ensure that the team remains competitive over a longer period, not just excelling in a single match.

3. Psychological building and cultural shaping: Coaches contribute to building a positive team culture and a strong mental outlook, which can help athletes better handle stress and challenges. This inner strength can play a role across multiple competitions, leading to more stable peak performances from the team.

## The Host Effect

The host effect refers to the phenomenon in sports events where the host team achieves unusually good results due to various advantages of being the host. To quantify the host effect, we used MATLAB to calculate the proportion of gold medals (total medals) won by a host country in previous Olympic Games relative to the total number of gold medals (total medals) won by all countries, and plotted the results for visual representation. Below are two typical examples.

1.Japan: Japan hosted the Olympics twice, in 1964 and 2020. It can be observed that during these two periods, their medal share was significantly higher, while in other periods, their medal rate fluctuated and was noticeably lower.



1. China: China hosted the Olympics only once, in 2008. A prominent peak can be seen during this period, while other periods show relatively stable growth.



### Quantitative calculation of the host effect:

By calculating the moving average of the difference in performance compared to other Olympic Games, the gain can be calculated as:

The meaning of the formula: *T* is the total step length, *n* is the number of Olympic Games, is the proportion of gold medals won by the host in the *n* th Olympic Games relative to the total number of gold medals, represents the average proportion of gold medals won by the host as a non-host in other Olympic Games. We set *T*=11 and calculated the host effect for gold medals over the past 44 years of Olympic Games.

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| --- | --- | --- | --- | --- |
| Year | Country |  |  |  |
| 1984 | United States | 0.3673 | 0.1962 | 0.1711 |
| 1988 | South Korea | 0.0498 | 0.0196 | 0.0302 |
| 1992 | Spain | 0.0500 | 0.0074 | 0.0426 |
| 1996 | United States | 0.1624 | 0.1962 | -0.0338 |
| 2000 | Australia | 0.0533 | 0.0269 | 0.0264 |
| 2004 | Greece | 0.0199 | 0.0045 | 0.0154 |
| 2008 | China | 0.1589 | 0.0855 | 0.0734 |
| 2012 | Great Britain | 0.0957 | 0.0419 | 0.0538 |
| 2016 | Brazil | 0.0229 | 0.0062 | 0.0167 |
| 2020 | Japan | 0.0794 | 0.0313 | 0.0481 |
| 2024 | France | 0.0488 | 0.0389 | 0.0099 |

Average: 0.0413, so the host effect for gold medals is approximately 4.13%.

Similarly, the host effect for silver medals is 0.0257 (2.57%), and for bronze medals, it is 0.0046 (0.46%, considered negligible in practice).

Final prediction result = Initial prediction result × (1 + AE)

|  |  |  |
| --- | --- | --- |
| Type | Initial Prediction | Final Prediction |
| Gold | 43.1 | 44.88 |
| Total | 115 | 123.23 |