The Queen's Gambit: Explaining the Superstar Effect Using Chess

We analyzed more than 30,000 games with 2.8 million moves from each unique "superstar" player and their opposition: Magnus Carlsen, Garry Kasparov, Anatoly Karpov, Bobby Fischer, Hou Yifan, and Igors Rausis.

Who is a "Superstar"?

A Superstar is an individual who shows outstanding performance and stands out from their peers. There is typically a substantial skill and achievement gap between a superstar and their competitors.

What is the "Superstar Effect"?

The Superstar Effect is any impact - negative or positive - that a superstar might have on other players in a tournament. These effects could be rational or psychological. For example, some players might "choke" under superstar pressure, other players might step up to the challenge and try even harder than they normally would.

Who are the chess superstars?

We identify five chess superstars: Magnus Carlsen, Garry Kasparov, Anatoly Karpov, Bobby Fischer, and Hou Yifan. All these players are (were) not only World Chess Champions, but also demonstrated dominant chess performance. We also consider the special case of a superstar, Grandmaster Igors Rausis, who competed in chess tournaments against amateur opponents, used computer engine assistance, and was banned by FIDE in December 2019.

Carlsen is a contemporary chess superstar, evidenced by his extraordinary performance over the past ten years. For example, his tournament win rate among the elite round-robin tournaments was 60%. The runner up was Fabiano Caruana, with a 30% tournament win rate.

What data did you use?

We used the games from Chessbase Mega Database 2020 and analyzed more than 30,000 games with more than 2.8 million moves that took place in the time span 1962-2019.

Did you use neural-networks in your analysis?

Yes. We wanted to compare the players' performances in games that looked as similar as possible in terms of difficulty and complexity. While there are different ways of approaching this problem, our approach was to train a neural-network algorithm that analyzed millions of mistakes of real players from a separate independent chess data sample. The network could then accurately predict in what positions human players were more likely to make a mistake and even gave an estimate on the severity of a mistake measured in centipawn loss, which turned out to be quite accurate. This enabled us to distinguish difficult games from easier, less complex games.

What did you find?

We found two main results. First, the direct superstar effect in head-to-head encounters is always negative: when players play against superstars, they end up making more mistakes than they are expected to in similarly complex positions. Second, the indirect superstar effect —the effect of superstar's participation in a tournament on other participants' performance—can be positive or negative. This effect depends on the dominance of the superstar. If the superstar is very dominant, then players perform worse. Otherwise, players perform better.

When players played against superstars, they ended up making more mistakes than they are expected to, in similarly complex games. This can be attributed to either a "choking" effect, or could mean that players quit more easily against stronger opposition. We believe that the choking effect is the more likely explanation.

Who was (is) the most dominant chess superstar?

It turns out that the least dominant superstar in our sample of five World Chess Champions is Magnus Carlsen, and the most dominant World Chess Champion is Hou Yifan. However, the most dominant superstar in was actually Igors Rausis. Unsurprisingly, his amateur opponents had no chances to win playing against a grandmaster assisted by a computer chess engine.

Where can I find your research study?

You can read more about our paper on SSRN and Researchgate.