

Coaching Applications

Analysis of the Personal Best Swim Times: 2016 Rio Olympics

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Abstract

Given the ultimate goal of any elite swimmer is to make an Olympic team. The Olympic games are the pinnacle of elite swimmers' careers where they strive to peak and produce personal best times. Therefore, the Olympics provides a unique benchmark by which to assess the successfulness of preparation regimes. The data was collected online and statistical tests were used to analyse the results. Across all of the individual swimming events of the 2016 Rio Olympic games (1075 event entries), just under a third of all swimmers (339 swimmers) were able to produce a new personal best time. These swimmers swam an average 1.6% faster than their previous personal best which occurred on average 14 months prior to the Olympics. Looking at the two thirds of swimmers that failed to produce a personal best time; these swimmers swam on average 1.5% slower than their actual personal best time. The importance of producing a personal best time at the Olympics is highlighted by the fact that four out of every five gold medallist winning swimmers at Rio produced a new personal best time. Combining this data with knowledge of actual preparation strategies employed by specific swimmers or teams will allow assessment of the relative success of an approach.

Introduction

A multitude of factors contribute to the rate at which a swimmer improves their personal best time. Previously, it has been suggested that an athlete's performance history and the limits of human physiology may be used to catch dopers. The problem is that currently it is unknown as to what constitutes a typical improvement in personal best time. There is a pertinent need to better understand performance profiling and how factors such as maturation affects a swimmer's rate of improvement. Estimates of progression and variability of swimming performance in competitions are also useful for coaches interested in predicting the required future winning swim times.

While it was reported that on average both the Australian and United States swim teams swam faster in the Sydney 2000 Olympics, compared to their respective Olympic Trials. It has also been shown that on average swimmers swam slower in the Athens Olympics compared to their final stage preparation phase prior to the games. A plethora of factors including illness, injury, the ability to psychologically cope with the big occasion, and even the pool itself through lane bias may sabotage a potential PB. The fact that the Olympic games occurs on a quadrennial cycle adds to the pressure of getting the peak right.

A considerable amount of training theory is based on the concept of peaking for competition through the implementation of a taper. The primary aim of the taper should be the elimination of accumulated fatigue, rather than to attain additional physiological adaptations or fitness gains, and should be achieved without compromising previously acquired adaptations and fitness level. But it has also been suggested that training insufficiency during final stage preparations is a possible reason for the ultimate overall performance decrement at the Olympics. Logistically, tapering theory needs to be implemented taking into account of when a countries selection trials are held. The scheduling of trials has been a contentious issue given its potential impact on subsequent Olympic performances.

Relative gain or decrement in swimming performance is regarded as the ultimate estimation of peaking successfulness. Using the Rio Olympics this paper takes an objective look, with the help of statistical tests, at the magnitude of improvements of swimmers with successful performances (new PB) while also reporting the degree to which performance is compromised when the plan goes wrong. This data will help to estimate expected performance improvements, predict future winning times, and may influence training and tapering decisions.

Methods

Data relating to all individual pool swimming events at the Rio 2016 Olympic games was collected in addition to each athlete's event specific pre-Olympic Games official personal best time and associated date that this was achieved. These results were obtained from either the Federation Internationale de Natation Amateur (FINA) or from the swimmers national governing swimming body. We calculated the relative difference between every swimmers' pre-Olympic swimming personal best time and their fastest official Olympic competition result and expressed this as a percentage.

Discussion

Overall at the Rio Olympics, when assessed across all 1075 event entries swimmers swam -0.5 % slower compared with their prior personal best. We found that ~ a third of swimmers produced a personal best time during the games with males and females having a similar chance of producing a personal best time. The average improvement in a personal best time was 1.6% faster, and on average this personal best time came ~14 months following their previous personal best time. By contrast, those that failed to produce a personal best time (~two thirds of the swimmers at the Rio Olympics) performed 1.5 % slower than their personal best time, which they set on average ~22 months prior to the games. Overall, swimmers in freestyle events produced performances closest to their personal best time, although on average there was still a 0.2% decline in performance. Swimmers in the breaststroke and backstroke events found it hardest to get close to their personal best, with the overall decline in performance approaching 1% slower. More than a third of swimmers entering freestyle events produced personal best performances whereas ~only a fifth could manage a personal best in the breaststroke events.

Other interesting findings were that younger swimmers (≥ 19 years) produced a better personal best success rate (42%) than older aged swimmers and were the only age category to on average swim faster (0.3%) than their previous personal best time. Only 19% of swimmers older than 25 years were able to set a new personal best time in Rio. Almost half (44%) of those swimmers whose last personal best time was achieved between 1 - 2 years ago produced a personal best in Rio, yet less than a fifth of swimmers got a Rio personal best when they last produced the feat more than two years ago. While, 81% of gold medal winners at the Rio 2016 Olympic Games achieved a personal best to win their event; silver and bronze medallists produced a personal best relatively less often at 62% and 54%, respectively (Figure 1). Coaches and sports administrators interested in performance time prediction should analyse the leading competitors' times and build in the event specific range of improvements in personal best times.

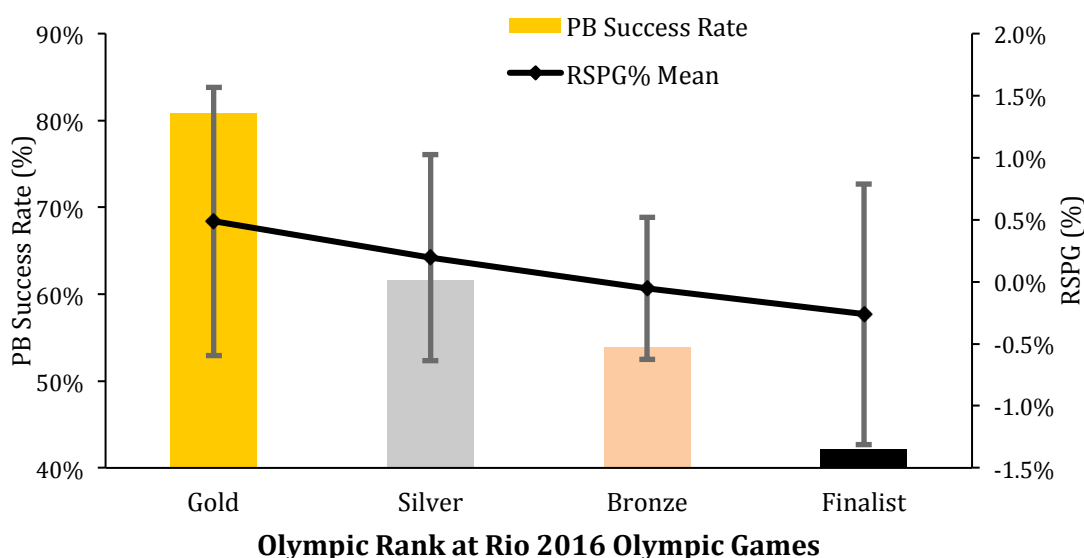


Figure 1. Relative swim performance gain % (mean +/- SD) and the success rate of attaining a personal best for individual swim event medalists and other finalists (positioned 4 to 8) at the Rio 2016 Olympic Games

Countries vary in when their Olympic trials are held and also in their implementation of training and tapering practices. Looking at the overall percentage improvement (or decrement) of each country's swim times compared to their swimmers previously reported personal best times provides a measure of the effectiveness of each country's particular approach. Comparing a sample of 24 nations we found, Croatia was the only nation that swam faster, however they only had four event entries. At the other end of the spectrum, Israel and Austria were the only two nations to swim more than 2% slower than their previously recorded average personal best times. In terms of having the highest percentage of swimmers producing new personal best times, the United States (50%), Japan (50%) and New Zealand (47%) were the top three performing nations, while Israel and the Czech Republic failed to produce any new personal best times at the Rio Olympics.

The reason that overall most nations swam slower than their personal best, could be explained by numerous external factors; but it does show the difficulty in correctly timing a swimmers peak. Maximizing performance in swimming relies on

the interaction between psychology, fitness, and also in the optimization of training volume, intensity and recovery and minimizing illness and injury. From a physiological point of view a taper can bring possible haematological changes, respiratory exchange stability and reduction in hormonal stress. Psychologically, tapering may reduce total mood disturbances, improve relaxation and quality of sleep. With these potential tapering benefits, any taper that is not effective can work against the athlete and these possible positives will be diminished.

It has been reported that an effective taper can lead to a performance improvement of 3% above a swimmer's prior final stage performance level. It is important to note, that measuring an improvement percentage from the pre-taper performance level may be a long way off an athlete's actual personal best, especially after a long and fatiguing build-up. Nevertheless, we found that swimmers producing a personal best in Rio had an average improvement of 1.6%, therefore a small proportion of swimmers would have exceeded the 3% improvement level. Effective tapering still requires a good understanding of the athlete involved in order to assess what overload level is required for that individual for it to be effective. Ultimately, differences in performance gains are explained in part by the differences in tapering regimes followed by each country. Knowing the background to a country's preparation strategy and matching this with our presented data will allow the determination of how successful a particular strategy was.

We quantified the likelihood of producing a personal best at the 2016 Rio Olympics and the magnitude of this improvement over a current personal best. Our analysis revealed that less than third of all event entries produced a new personal best at the Olympics. While of those that did manage to produce a personal best, the mean improvement was swimming 1.6% faster, and their Olympic personal best came a mean of ~14 months after setting their previous personal best. Furthermore, younger swimmers (≥ 19 years) were more than twice as likely to produce a personal best time as swimmers older than 25 years.

These factors may be useful for sports administrators and coaches to consider in allocating their limited financial resources and implementing selection policy to maximise targeted success. While the current research describes factors external to swimmers, future endeavours should consider the physiological factors affecting the magnitude of improvements in personal best times. Further modelling of performance and time predictions will allow coaches to better predict expected winning times at future games.

Conclusion

The ability to maximize performance on a particular day is a challenge to all athletes, coaches and scientists. Olympic athletes face the tougher challenge of having to truly peak once every 4 years; while for some swimmers getting selected for only one Olympics – this day will be targeted as a career peak. Combining our data with knowledge of actual preparation strategies employed by specific swimmers or teams allows the relative success of a said approach to be assessed. This information is beneficial for those making performance predictions and training programming decisions for future events. The research provides a greater

insight of the levels of performance required to win an Olympic Games medal. Coaches can use this data to make informed decisions as to whether an athlete will reach the Olympic standard and consequently have a realistic opportunity of winning a medal.