

## Medal-winning Enhancements of Performance

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Enhancements that win medals and studies on strategies or factors affecting medal winning depend on whether the sport is non-interactive, interactive non-match-play, or match-play. Athletes in non-interactive sports vary in their performance time or distance from one competition to the next, typically by 0.5-2% in track and field, cycling, rowing, canoe and winter sports (1). Simulations show that the smallest important enhancement of one extra medal every 10 competitions for a top athlete is achieved with a change in performance of 0.3 of the variability (2). Factors producing such changes can be studied in laboratory or field tests, or even in competitions, but dozens of athletes and/or multiple repeated tests or competitions are required for adequate precision (3). Factors affecting medal-winning in interactive non-match-play sports, such as mass-start cycle races, can be studied only in competitions. In such sports finish time is a poor measure of performance, but the logarithm of the finish rank of the athletes can be analysed in the same manner as the performance score in non-interactive sports (4). Again, large numbers of athletes and competitions are required. In match-play team or combat sports, the smallest important enhancement would win one extra gold- or bronze-medal match every 10 matches (1). Factors producing such enhancements apply to earlier matches in the tournament or season, and there are often enough matches to provide reasonable precision in logistic-regression analyses (e.g., 5). With team sports the Holy Grail is an analytical method for identifying the changes in match performance indicators and fitness tests of individual athletes that would result in their team winning more matches.

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