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Athletes' testosterone surges not tied to winning, study finds

Kathleen Casto, number 1931 in the center, shown competing in cross country as an undergraduate in North Carolina. She is now a graduate student in psychology at Emory, studying the hormonal correlates of competition in women.

By Carol Clark

A higher surge of testosterone in competition, the so-called "winner effect," is not actually related to winning, suggests a new study of intercollegiate cross country runners.

The International Journal of Exercise Science published the research, led by David Edwards, a professor of psychology at Emory University, and his graduate student Kathleen Casto.

"Many people in the scientific literature and in popular culture link testosterone increases to winning," Casto says. "In this study, however, we found an increase in testosterone during a race regardless of the athletes' finish time. In fact, one of the runners with the highest increases in testosterone finished with one of the slowest times."

The study, which analyzed saliva samples of participants, also showed that testosterone levels rise in athletes during the warm-up period. "It's surprising that not only does competition itself, irrespective of outcome, substantially increase testosterone, but also that testosterone begins to increase before the competition even begins, long before status of winner or loser are determined," Casto says.

Casto was a Division I cross country runner as an undergraduate at the University of North Carolina, Wilmington. She majored in psychology and chemistry and became interested in the hormonal correlates of competition in women. She applied as a graduate student in psychology at Edwards' lab when she learned about his work.

Cross country is "an intense experience."

Edwards has been collecting data since 1999 on hormone levels of Emory sports teams that have volunteered to participate. The research has primarily involved women athletes. Edwards' lab also developed a questionnaire to measure the status of an athlete. Members of the team rate the leadership ability of other individuals on the team, to provide a combined rating score for each of the participating athletes.

Many of the labs' previous studies involved sports such as volleyball and soccer that require team coordination, intermittent physical exertion and only overall team outcomes of win or loss. Casto wanted to investigate how hormones relate to individual performance outcomes in cross country racing.

Cross country racing is both a team and individual sport. Teams are evaluated through a points-scoring system, but runners are also judged on their individual times, clearly ranking their success in an event.

"Cross country running is a unique sport. It's associated with a drive to compete and perseverance against pain over a relatively long period of time," Casto says. "It's an intense experience."

Participants in the study were consenting members of the 2010 and 2011 Emory varsity men's and women's cross country teams. Each participant provided three saliva samples: One before warming up (to serve as a baseline), one after warming up, and a third immediately after crossing the finish line.

Testosterone went up from the baseline for both men and women during the warm-up, while levels of cortisol – a hormone related to stress – did not.

At the end of the race, both men and women participants showed the expected increases in cortisol and surges in testosterone. Neither hormone, however, was related to finish time.

This research follows on the heels of a 2013 study of women athletes in a variety of sports by Edwards and Casto, published in Hormones and Behavior. They found that, provided levels of the stress hormone cortisol were low, the higher a woman's testosterone, the higher her status with teammates.

The body uses cortisol for vital functions like metabolizing glucose. "Over short periods, an increase in cortisol can be a good thing, but over long periods of chronic stress, it is maladaptive," Casto says. "Among groups of women athletes, achieving status may require a delicate balance between stress and the actions or behaviors carried out as a team leader."

Higher baseline levels of testosterone have been linked to long-term strength and power, such as higher status positions in companies.

"Although short-term surges of testosterone in competition have been associated with winning, they may instead be indicators of a psychological strength for competition, the drive to win," Casto says.

Photos courtesy Kathleen Casto.