

# Faster, higher, stronger!

On the eve of the Olympics and Paralympics, **Christian Jarrett** dives into the psychology of competition

Legends will be born and dreams will die this summer as London becomes a crucible for the ultimate sporting competition. The pressure will be intense. How will the athletes cope? Will the heat of competition lift our sporting heroes to new heights or will it stifle their promise?

## New heights

Investigations into the beneficial effects of competition are as old as psychology itself. In a classic 1898 paper, Norman Triplett of Indiana University observed from race data that cyclists recorded faster times when competing against others than alone against the clock. He then confirmed this competitive benefit experimentally using an adapted fishing reel – a test widely regarded as the first ever study in social psychology.

Forty boys and girls reeled round a flag on a silk cord as fast as they could and Triplett noted that most of them performed better when they competed against another participant, as opposed to when they were alone. Although a 2005 statistical analysis of his results in fact found no effects of competition, Triplett's study heralded more than a century of research into what became known as the 'social facilitation' effect of performing with others.

Modern examples of the benefits of competition are easy to find. Consider a 2003 weight-lifting study by Matthew Rhea and his colleagues at Arizona State University. Given one

chance to lift the maximum weight possible in front of an audience, both male and female amateurs bench-pressed more, by an average of 2kg, when competing against another person than when lifting by themselves. Or take a lab study of endurance published just last year by Andrew Cooke and his team at the University of Birmingham. They reported that male and female participants sustained a tight hand-grip for 21 seconds longer (a 22 per cent increase) when competing against six others simultaneously, compared with when completing the challenge on their own.

## Racing hearts

Why does competition have these beneficial effects on performance? Some of it boils down to sheer physiology, as we invest extra energy into beating our opponents. In their hand-grip study, for example, Cooke's team showed how the

competitive condition was associated with increased heart rate, decreased heart rate variability (considered a marker of increased effort) and increased muscle activity, as compared with performing alone. Crucially, the change in heart rate variability partly mediated the improved performance observed in the competitive condition.

Similar observations were reported by the same lab in 2001, even though the challenge didn't require physical exertion. Led by Lesley Harrison, this experiment involved 36 participants playing the Scalextric toy car racing game, either competitively, cooperatively (avoiding collisions), or alone. The competitive condition was associated with higher blood pressure and heart rate than the other conditions, as well as a shortening of the cardiac pre-ejection period (a sign of increased adrenaline).

Competition also affects the hormones, especially testosterone. In 1999, Ferran Suay and her colleagues at Universidad de Valencia studied judoists before, during, and after a competitive bout compared with during a non-competitive exercise session involving the same amount of physical exertion. The competitive context was associated with higher testosterone and cortisol levels prior to and during the bouts, relative to the non-competitive context.

Unsurprisingly, competition outcomes also make a difference. After the bouts in Suay's 1999 study, winners had higher cortisol levels than losers. Many other studies have documented higher

testosterone levels in winners and drops in testosterone in losers (especially in men). Suay's research group, including co-worker Alicia Salvador, have also found correlations between pre-bout testosterone levels and the frequency and duration of threats and attacking moves shown by a judoist during the ensuing bout – behaviours the researchers said were a sign of



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dogged persistence.

Interest has turned lately to drug-free ways to boost athletes' testosterone levels before they compete, with the hope of adding some bite to their performance. For example, a study published this January involved professional rugby players watching sad, erotic, aggressive, training or humorous video clips (featuring starving children, exotic dancing, big rugby hits, a fighter training or a sitcom, respectively) before attempting to lift the maximum weight possible in a free-weight challenge. Christian Cook and Blair Crewther at Imperial College reported that the men lifted heavier weights after the erotic, aggressive and training clips and that these same videos were associated with increases in testosterone.

### It's the taking part

What about the mental processes underlying the performance benefits of competition? Perhaps a clue comes from the father of the modern Olympics, Pierre de Coubertin, who said: 'The important thing in life is not the triumph but the struggle. The essential thing is not to have conquered but to have fought well.' Extending this idea, some intriguing new studies show the importance not just of fighting well, but of taking pleasure in it. In fact, enjoying the competition could make it more likely that you'll win.

Peter Totterdell at the University of

Sheffield equipped professional county cricketers with pocket computers and had them rate their moods during a three- or four-day match. They entered the data before and after each day's play, as well as at lunch and during tea breaks. Totterdell found links between players' mood and performance (measured subjectively and objectively), such that players who reported feeling happy, focused, energetic, enthusiastic and confident tended to go on to play better (of course, it is possible that some third factor influenced both mood and performance, so caution is

needed in interpreting these results).

In a follow-up study, Totterdell looked at links between a team's average mood and the moods of individual players. This appeared to show that, independent of match events, players could be infected by the mood of their team, being particularly likely to catch positive moods. There were also links between average team mood and a player's performance, via the effect of the team's mood on that player's own mood. Older and more committed players were the most sensitive to these mood contagion



## How will the Olympics affect you?

**It's not just the participating athletes who will be affected in body and mind by this summer's Olympics. By identifying strongly with their nation's sporting heroes, fans too will be changed. Consider a 1992 study by Edward Hirt at Indiana University and his colleagues, in which dozens of students watched their university basketball team either win or lose. Among those students who were keen fans, witnessing a win boosted their mood and self-esteem; it also affected their confidence in the team's future performance, and in their own personal abilities. Witnessing a loss had the opposite, adverse effect.**

**A study published this year suggests, thankfully, that the positive emotional effects of enjoying a win may be longer-lived than the negative effects of seeing your team lose. Marc Jones at Staffordshire University found that, four days after a World Cup game, English fans were no longer negatively affected by seeing their team lose; the Spanish, by contrast, were still enjoying the fillip from seeing their team win.**

**These influences are likely to be mediated by physiological mechanisms that mirror what's happening in the bodies of the participating athletes. Paul Bernhardt at the University of Utah and his co-workers measured the testosterone levels of basketball fans after they'd watched their favourite team win or lose, and of football fans after they'd seen their country win or lose in the World Cup. Just as if they'd won or lost themselves, the fans exhibited testosterone increases or drops, respectively.**

**Fans respond to these benefits and costs by engaging in what psychologists call BIRGing (basking in reflected glory) and CORFing (cutting off reflected failure). For instance, it's been shown after a win that fans are more likely to talk about their team in the first person plural – as in 'we did a great job' – and to wear the colours of their team or country. Will you still wear your new GB apparel if the medals remain elusive?**

**Watching the Olympics could also play tricks with your memory. There's evidence that negative sporting events are remembered in more detail and more consistently than positive outcomes. Elizabeth Kensinger at Boston College and Daniel Schacter at Harvard made this finding after testing the memory of Red Sox and Yankees fans and neutrals days after the New York Yankees lost to the Boston Red Sox in the 2004 American League play-off series.**

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## competition

effects. Based on his findings, Totterdell recommended that 'Coaches and players should...consider incorporating the development of mood control skills within players' training schedules,' and that 'team managers and coaches should clearly give consideration to the mood profile of their team'.

Another demonstration of the performance benefits of enjoyment came from a US study of school basketball players. John Tauer at the University of St Thomas and Judith Harackiewicz at the University of Wisconsin-Madison observed hundreds of young boys and girls taking free throws at a basketball hoop. The boys either performed cooperatively with a partner, trying to achieve as many baskets as possible between them; or they performed alone against a partner, trying to score more baskets than him/her; or they performed cooperatively with a partner against another pair. The children enjoyed the last context, mixing cooperation and competition, the most, and they also performed best under those rules. What's more, greater enjoyment was found to mediate their superior performance.

Why should greater enjoyment lead to better performance? 'When we enjoy what we are doing, we are more likely to get absorbed by the activity, focus our attention on it, be less likely to be distracted, and more likely to be in a flow state,' says Tauer. 'All of this leads to elevated performance. We also know that the better one performs, the more one tends to enjoy an activity, so enjoyment can lead to better performance can lead to more enjoyment, and so on.'

Tauer, who as well as being a psychologist is also head basketball coach at his university, says there's no doubt that athletes who enjoy what they are doing will be more motivated and engaged in practice sessions and this will lead to improvement and better performance. 'This enjoyment is not the giggling, not-very-serious type of fun we might think about,' he says, 'rather, it is a focused

enjoyment where athletes are completely in the zone, immersed in an activity, with nothing to distract them, cause them anxiety, or lead them to doubt themselves. The confluence of these factors helps promote both enjoyment and optimal performance.'

## Rivals

Of course, athletes often aren't just competing against anonymous opponents, they're battling against rivals with whom they have a chequered, personal history. From Coe and Ovett, through Nadal and Federer, to Usain Bolt versus his younger compatriot and training mate Yohan Blake in London this summer, these rivalries are entertaining for fans, and it seems likely that when things get personal this is another factor that drives athletes to train longer and fight harder.

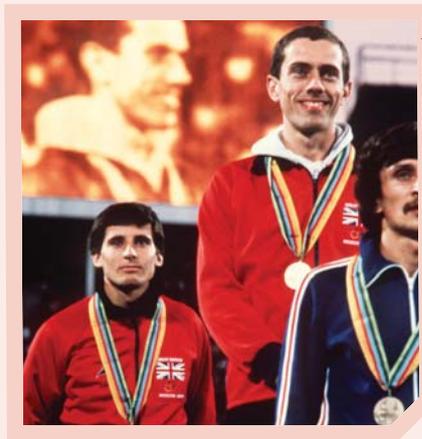
Rivalry is a specific aspect of competition that psychologists have only just started to study. Leading the field in

independent of the objective or tangible stakes of competition,' he says. 'In other words, rivals are motivated to outperform each other not just because of what is at stake in the competition, but also because of their history with one another and the implications that future competitions between them have for this broader competitive relationship.'

In a 2010 study of university basketball teams, Kilduff identified the factors that appear to foster an intense rivalry between teams, including geographical proximity, similarity in status and a competitive history. Regarding the last of these, more frequent and more hotly contested prior clashes predicted greater feelings of rivalry.

What kind of an effect does rivalry have on performance? Kilduff's basketball study suggested that players exhibited greater effort (in terms of greater defensive efficiency and blocked shots) when up against teams with whom they shared greater rivalry. In a separate and as yet unpublished study, Kilduff also looked at the effect of rivalry on the performance of runners. Using several years of race data from a running club in northeast USA, he found that runners recorded faster times when a rival was present in the starting line-up (rivals were identified by their similarity, in terms of age and gender, and based on a history of close contests). In performance terms, this boost was reflected in an average five seconds per kilometre increase in speed. It's possible these performance benefits are mediated in part by hormonal changes – a 2003 study of junior Premiership footballers by UK researchers found that the players' testosterone levels were higher in anticipation of a match against a team considered to be an extreme rival.

The negative flipside of the performance-enhancing effects of rivalry could be something called the n-effect. The term was introduced by Stephen Garcia at the University of Michigan and Avshalom Tor at the University of Haifa in a 2009 study, in which they



Coe and Ovett on the podium in Moscow

this respect is Gavin Kilduff at New York University's Stern School of Business. 'Rivalry is a subjective competitive relationship characterised by heightened psychological involvement and stakes

- performance. *Journal of Strength Conditioning Research*, 17, 303-306.
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documented the way people's performance on exams and quizzes suffered when there were more competitors. The researchers concluded that the n-effect occurs because when the competitive field is more populated people are less prone to compare their performance against others. 'As the number of competitors increases, the forces underlying social-comparison processes typically diminish,' they wrote, 'making social comparison less important and dampening competitive motivation.'

### Choking

So far we've seen the manifold ways that competition can marshal motivation, channel adrenaline and raise performance. But what about those athletes who collapse under the pressure? It can happen to the greatest. In one particularly infamous example, golfing legend Greg Norman took a six-shot lead into the final round of the 1996 Masters Tournament, only to suffer a complete meltdown.

Numerous theories have been proposed to explain the potential adverse effects of competition. Michael Eysenck and Manuel Calvo in the 1990s suggested that the stress of competition has a dual effect – it generates anxiety, which distracts from the task, but it also provokes extra effort. When choking occurs, this is because the distracting effects on the central executive outweigh the benefit of increased effort. A study of volleyball players by Nickolas Smith at MMU and his co-workers in 2001 provided some support. At critical points in the game, low trait-anxiety players benefited from their increased effort but high trait-anxiety players didn't, presumably because of the distracting effects of anxiety.

Other labs have explored the adverse physiological effects of competitive pressure. Andrew Cooke and his collaborators observed female golfers in high- and low-pressure situations on the putting green. High pressure increased heart rate and increased the muscular activity in the women's forearms, probably caused by a tighter grip on the club. In turn, this led them to swing the club with greater acceleration, which had a detrimental effect on accuracy.

Another popular theory is that pressure can cause experts like Greg Norman to regress, in the sense that they start thinking too much about highly skilled movements that had become automated. Support for this 'reinvestment theory' comes from studies like the one published by Daniel Gucciardi and James Dimmock at The University of Western

Australia in 2008. They challenged experienced Australian golfers under high- or low-pressure putting conditions. Additionally, they instructed the golfers to focus on certain words as they performed – in one condition, the words were designed to cause them to think about the components of their technique (e.g. 'arms', 'weight', 'head'); in another condition the words were irrelevant (e.g. colours); and in a final condition the golfers focused on just one word that was designed to provoke a holistic approach to technique (e.g. 'smooth'). Under high-pressure situations (but not low-pressure), the golfers who were focused on components of their technique suffered a loss in performance, suggesting they were thinking too much about the minutiae of their technique. The best performances were by the golfers who focused on a word like 'smooth'.

Is there anything that athletes can do

to ensure they respond to pressure in a beneficial way? According to the 'theory of challenge and threat states in athletes' proposed by Marc Jones at Staffordshire University and his colleagues, the effects of competitive pressure depend on whether an athlete's judgement of their skills and resources leads them to construe the situation as a threat, or as a challenge and a chance to shine. 'To cultivate a challenge mindset for the Olympics,' says Jones, 'athletes should enhance their confidence, remind themselves of what they can control and keep a focus on achieving success rather than dwelling on avoiding failure.' Or, as the psychology graduate and heptathlete Jessica Ennis put it in a 2009 interview: 'You have to conquer your own nerves, run your own race, do your own competition.'

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## Lessons beyond the world of sport

**The psychological relevance of competition extends beyond the world of sport. Think of schools, where teachers may deliberately instil a competitive culture as a means of improving achievement. Research in the 1970s suggested doing so improves pupil performance on boring tasks (e.g. see Senior & Brophy, 1973). But other studies have highlighted motivational costs and other drawbacks of a competitive classroom setting. A Hong Kong study published in 2008, for instance, found that creative writing pupils in a competitive situation suffered a loss of self-efficacy (belief in their own ability) while pupils in a non-competitive context did not.**

There have always been artistic rivalries, but thanks to the rise of TV shows like *The X-Factor*, competition is also becoming a more overt part of creative success. This may not be such a bad thing. In research published last year, the performance of keyboard players who improvised under competitive conditions after listening to a snippet of Prokofiev was rated as more creative (though not technically superior) compared with those who improvised in a non-competitive context. Participants performing competitively also reported more intrinsic motivation; however, this came with a dose of extra stress.

Competition is also an essential part of many people's working lives as they attempt to climb the greasy pole of success. The appropriateness of a competitive attitude will obviously vary with the working context. Long Lam at the University of Macau found that sales staff at an international insurance firm who were more competitive (they agreed with statements like 'It is important for me to perform better than others') tended to also engage in more so-called 'discretionary behaviours', going the extra mile in the pursuit of their duties. A follow-up study in the retail sector found that highly competitive staff reported greater emotional commitment to their company when they perceived there to be a competitive culture. On the negative side, unpublished research by Gavin Kilduff and his colleagues suggests that rivalry can encourage unethical behaviour, including the false reporting of achievements. Kilduff is also examining the strategic decision making of corporate executives, with the hypothesis that rivalry can lead to a preoccupation with one's longstanding rivals that may limit consideration of other competitive threats.

This 'tunnel vision' idea chimes with the experience of psychologists who are taking lessons from sports psychology and applying them to business and vice versa. The Lane4 consultancy was co-founded by the Olympic gold-medallist swimmer Adrian Moorhouse, together with sport psychologist Graham Jones. The company's Europe Practice Director Dominic Mahony (a former Olympian and the current Pentathlon GB team leader) has highlighted 'Beating the Brits syndrome' – the tendency for athletes and business people to be preoccupied by internal rivalries rather than focusing on the external competition.