Why we should *not* dismiss a relationship between attractiveness and performance: a comment on Smoliga and Zavorsky (2015)

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Smoliga and Zavorsky (S&Z) [1] dismiss a series of studies reporting a relationship between facial attractiveness and sports performance because the proportion of variance explained is small and the effect may not be generalizable to the general population. They therefore conclude that such studies 'have questionable biological importance' and 'are not valid for studying evolution'.

While few will disagree with S&Z when they write that statistical significance does not equal biological significance, their suggestion that biological meaningfulness can be equated to the proportion of variation explained (measured by r^2; see their first recommendation for future research) is open to debate: Although the low r^2 reported in, for example, [2] indeed means that physical appearance alone poorly predicts performance of a Tour de France rider, the prediction of whether a Darwin's finch is going to survive to the following year on the basis of its beak size is similarly imprecise (r^2=0.06-0.09), and this despite a significant relationship between beak size and survival [3]. Their definition of biological meaningfulness would thus lead S&Z to dismiss a textbook example of natural selection.

Fitness components such as survival, reproductive success and attractiveness are complex traits, and any single variable will - by definition - explain only a small amount of variation.

Hence, r^2 is a poor measure of the strength of selection, which is instead measured by the selection differential, i.e. the covariance between some component of relative fitness (w) and the trait of interest (z) [see e.g. 4]. If z is standardised to have a variance of one, a standardised selection differential can be obtained by regressing w on z,. Importantly, whereas the slope is given by the covariance between w and z, divided by the variance in z (which is equal to one if z is standardised), the r^2 is equal to the covariance between w and z squared, divided by the product of the variances in w and z. Hence, even if the slope is steep (and selection therefore strong), r^2 will be low whenever variation in w is large and attributable to a multitude of factors other than z. Given the complex and multidimensional nature of both endurance performance and attractiveness, their shared component will therefore always be small, and expecting r^2 to be any higher would be naïve. The low r^2 of a relationship between facial attractiveness and performance is therefore a poor reason to dismiss its evolutionary relevance.

Whereas [2] reports the slope of untransformed attractiveness on performance, the standardised estimate of the strength of sexual selection within the 2012 Tour de France peloton, estimated as the slope of the regression line of *relative* attractiveness on *variance-standardised* performance, is 0.056. This means that an increase in performance by one standard deviation comes with a 6% increase in attractiveness. Albeit weaker than the median strength of linear sexual selection observed in non-human animals (0.18) [5], assuming attractiveness is correlated with reproductive success, theory predicts (a preference for) performance to evolve. Although there are various reasons why we have to be careful making such predictions [6], the low proportion of variance that performance and attractiveness have in common is not among them.

S&Z furthermore make the obvious point that the Tour de France peloton is not a random sample of the general population, capturing only a fraction of all variation in performance that exists. How the absolute and relative importance of genes ('talent') and environment ('training') in shaping variation in performance [sensu 2] differs between the Tour de France peloton and the general population is an outstanding question. However, assuming that it is the variation of non-genetic origin, attributable to e.g. variation in training quality and volume, that is reduced in particular, performance variation within the peloton may arguably be more representative of the variation that selection has acted upon during our evolutionary history [7, 8]. If this indeed is the case, testing for a relationship between attractiveness and performance in the general population, including both couch potatoes and ambitious athletes, addresses an interesting, but fundamentally different question, and dismissing the pattern observed in [2] by extrapolating it to the general population would be fallacious.

S&Z and I agree that an evolutionary perspective may provide novel insights into the nature of human physical fitness, and it is beyond doubt that a conclusive demonstration of endurance performance being subject to sexual selection, now or in our evolutionary past, will require more research. It is therefore unfortunate that several of their recommendations for future studies are misguided and therefore unlikely to bring us closer to an answer.

Competing interests

I have no competing interests.

References

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