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Journal of Theoretical Biology

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Letter to the Editor

On the evolutionary consequences of a Trivers-Willard effect in humans: Further analysis of Dr S. Kanazawa's paper on 'beautiful parents'

In the past decade, Dr S. Kanazawa has published several stimulating papers that contribute to our understanding of the role of evolutionary processes in shaping human behavior. In this letter, we consider some theoretical aspects emerging from a study investigating child's sex variation in relation to parental physical attractiveness (Kanazawa, 2007). The author, who generalizes the seminal model of Trivers and Willard (1973), suggests that "beautiful parents" should have more daughters because physical attractiveness is heritable and impacts the reproductive success of daughters more than sons. Analyses of data from the National Longitudinal Study of Adolescent Health are presented to support this prediction. Our aim is not to discuss the soundness of this conclusion (see Gelman, 2007), but to focus on the author's further prediction regarding its "evolutionary consequences" (Kanazawa, 2007, p. 137). The author states, "if physically more attractive parents have more daughters, and if physical attractiveness is heritable, then it logically follows that women over many generations throughout evolutionary history gradually become more physically attractive on average than men" (p. 138). The author tests this prediction by comparing the distributions of physical attractiveness in contemporary men and women, as assessed by interviewers. Below, we first discuss the author's choice of using a subjective value of attractiveness to test for his prediction, before investigating the relevance of using objectively measurable traits. Then, we discuss his choice of comparing contemporary women and men to investigate gradual changes, before analyzing the formulation of the prediction itself and proposing a possible alternative. Overall, we believe that Dr S. Kanazawa has raised a quite stimulating issue.

1. Subjective or objective assessment of physical attractiveness?

As a measure of physical attractiveness, Dr S. Kanazawa used the opinion of in-home interviewers who were asked to rate the respondent's physical attractiveness on a five-point ordinal scale. As women were more often rated "attractive" or "very attractive" (leading to a higher average attractiveness score), the author concludes that "women appear to be significantly more physically attractive than men". However, these subjective assessments of physical attractiveness are prone to many important biases. The scores are actually subjective for two reasons.

First, they depend on the characteristics of the individual who is doing the rating, including, more importantly, his/her sex (e.g. Rhodes, 2006) and sexual orientation (e.g. Little et al., 2008). Here, no information is provided on the interviewer. Furthermore, inter-interviewer reliability cannot be estimated because only one interviewer rated each respondent. The total number of interviewers involved is also missing. Together, these issues make the reliability of this attractiveness measure questionable.

Second, and more importantly, assigning a score *de facto* involves a comparison. When judging a respondent's attractiveness, an interviewer inevitably compares the person he/she faces to other respondents, and, more generally, to anybody met before. Therefore, the scores directly depend on his/her previous experience (see Kenrick et al., 1989) and do not index any "objective" or "intrinsic" attractiveness. It is likely that within any population (or "sub-population" of either sex), some people would be scored as "very attractive", others as "very unattractive", and most as "intermediate", regardless of the average value of any hypothetical index of "objective attractiveness". Consequently, the difference in male and female distributions of physical attractiveness probably says little about their relative "objective attractiveness", the question addressed by the author, but instead reflects their relative potential to be found attractive. Although this may be a quite relevant measure in other fields of evolutionary psychology, and in particular for sexual selection aspects, we suggest that this approach does not allow drawing a reliable conclusion in the context of this study.

Is there then any alternative that could be used? An objective way to investigate whether women are more attractive than men would be to consider measurable traits known to be involved in attractiveness. Among others, symmetry or averageness, as mentioned by the author, may play an important role in physical attractiveness and mate choice in both women and men (Grammer et al., 2003). However, at least two important assumptions are required to allow reliable between-sex comparisons. First, these traits must have the same relative importance in determining the attractiveness within each sex. In other words, a comparison between men and women for a given trait would be pointless if this trait was highly determinant of attractiveness in one sex, but less important for the other (see Kościński, 2007 for some examples). Second, the value of these traits should not be affected by sex *per se*. For example, because testosterone suppresses the immune system, adolescent men may be more vulnerable to the effects of stress than women, leading to a higher susceptibility to future asymmetry (Simmons et al., 2004). Thus, comparing male and female symmetry could be meaningless if men are intrinsically less symmetric. Furthermore, we have focused so far on traits involved in both male and female physical attractiveness, in order to allow a comparison. However, many traits are involved in

physical attractiveness, including sex-specific ones, such as penis length and breast symmetry (Grammer et al., 2003, Dixson et al., 2007), which obviously cannot be compared. Although the use of a “composite index”, independently built for each sex and based on the relative importance of all the traits involved in mate choice may seem to offer an alternative, it would not circumvent the problem of the comparison of sex-specific traits. Besides obvious methodological concerns (beginning with the identification of “all” the traits), such traits would indeed indirectly be compared when comparing the average values of this index between sexes. Furthermore, such an index would again require, at some stage, the use of a subjective approach. For example, while we may objectively assess the relative importance of symmetry in overall male physical attractiveness, the score attributed to a given level of symmetry (required to further give a global score for the index for each man, before computing the average) will, again, depend on the rater’s previous experience.

Hence, comparing male and female physical attractiveness, if meaningful, would prove to be quite challenging.

2. How to investigate which changes?

In the above considerations, we discussed the use of two different approaches (subjective vs. objective assessment of attractiveness), but both were based on a static comparison between contemporary men and women, thereby following the author’s reasoning. However, his prediction originally pertained to gradual changes in physical attractiveness (“women should gradually become more attractive than men”, see abstract or p. 138). Finding a difference between contemporary men and women in attractiveness is in agreement with the prediction, but it does not prove it, contrary to what is suggested in the paper. Clearer support for the prediction would come from repeated between-sex comparisons across generations. Nevertheless, as we argue above, it is unlikely that the subjective approach of repeated interviews would allow detection of any significant pattern over time, even if women attractiveness did gradually increase relative to men (what, we understood, is implicit in the paper). Further, as previously suggested, the use of an objective approach would be, if feasible, quite challenging. Reconsidering the prediction itself may help to end the deadlock.

“If physically more attractive parents have more daughters, and if physical attractiveness is heritable”, the author predicts that women should “gradually become more physically attractive on average than men” (p. 138). However, a more parsimonious prediction is that women should become more physically attractive “compared to before”, rather than “compared to men”. Except for allowing a static comparison between contemporary men and women, which is easier than investigating the past, we do not see any particular reason for the author’s formulation. Also, given (1) the kind of test the author chose to perform (i.e. a between-sex comparison in contemporary attractiveness) and (2) his claim that women being more attractive than men “confirms” his prediction (see abstract), we *a posteriori* understand his prediction (women should “gradually become more physically attractive on average than men”, p. 138) as an expectation of a mere increase of the between-sex difference in attractiveness through ages, women being more attractive than men from the “beginning”. However, this does not have to be the case, even if we had to subscribe to the author’s reasoning (more daughters to attractive parents, attractiveness heritability and reliability of between-sex comparison in attractiveness): while women could *eventually* become more attractive than men, the “initial” distributions of attractiveness, as well as the rate of changes, are indeed unknown. For instance, men could still be more attractive than women, while women are “catching up”. Moreover, and more importantly, predicting women to become more attractive

“compared to before” rather than “compared to men” would avoid the doubtful comparison of attractiveness between sexes. Consequently, we suggest that investigating the “evolutionary consequences” of “beautiful parents” having more daughters would be more meaningful if this involved a comparison within sexes through time (instead of between sexes through time or, even less, between sexes at the present), women being expected to show a higher rate of increase in attractiveness compared to men.

Testing the prediction as we propose would also, admittedly, be challenging, whatever the kind of measure being chosen (i.e. the measure of traits, or the assessment of attractiveness via scores). First, there are practical concerns. Although pictures, paintings or sculptures may exist, the limitations of using such items are obvious: among many others, precise measurements of traits, if meaningful in the case of paintings or sculptures, would be challenging. Further, movements, sounds and odors, also important to attractiveness (Grammer et al., 2003, Wedekind et al., 1995), would not be represented. Second, no other pressures (selective or not) besides mate choice should affect the traits involved in attractiveness through time (e.g. see the recent increase in the prevalence of obesity in developed countries). Finally, these traits (and their relative importance) have to remain the same “throughout the evolutionary history” (p.138), for both sexes. This is a core assumption underlying the author’s entire reasoning. However, traits shaping attractiveness may vary across environments and cultures (e.g. symmetry: Little et al., 2007, waist-to-hip ratio in women: review in Gangestad and Scheyd, 2005), but also across “sub-populations” of the opposite sex (odors: Wedekind et al., 1995, eyes color: Laeng et al., 2007), and, thus, across time.

Hence, although we believe that Dr S. Kanazawa did not precisely perform the test of his prediction, as he chose a subjective measure of attractiveness and performed a static comparison and, further, although we suggest that the formulation of this prediction is equivocal, we believe that he raised a quite stimulating question.

Acknowledgments

We thank Étienne Danchin, Kyle Dexter, Jean-Michel Gaillard, Dominique Pontier and an anonymous referee for their comments on earlier drafts.

References

- Dixson, B.J., Dixson, A.F., Morgan, B., Anderson, M.J., 2007. Human physique and sexual attractiveness: sexual preferences of men and women in Bakossiland, Cameroon. *Arch. Sex. Behav.* 36, 369–375.
- Gangestad, S.W., Scheyd, G.J., 2005. The evolution of human physical attractiveness. *Annu. Rev. Anthropol.* 34, 523–548.
- Gelman, A., 2007. Letter to the editors regarding some papers of Dr. Satoshi Kanazawa. *J. Theor. Biol.* 245, 597–599, doi:10.1016/j.jtbi.2006.11.005.
- Grammer, K., Fink, B., Möller, A.P., Thornhill, R., 2003. Darwinian aesthetics: sexual selection and the biology of beauty. *Biol. Rev.* 78, 385–407.
- Kanazawa, S., 2007. Beautiful parents have more daughters: a further implication of the generalized Trivers–Willard hypothesis (gTWH). *J. Theor. Biol.* 244, 133–140, doi:10.1016/j.jtbi.2006.07.017.
- Kenrick, D.T., Gutierrez, S.E., Goldberg, L.L., 1989. Influence of popular erotica on judgments of strangers and mates. *J. Exp. Social Psychol.* 25, 159–167, doi:10.1016/0022-1031(89)90010-3.
- Kościński, K., 2007. Facial attractiveness: general patterns of facial preferences. *Anthropol. Rev.* 70, 45–79.
- Laeng, B., Mathisen, R., Johnsen, J.-A., 2007. Why do blue-eyed men prefer women with the same eye color? *Behav. Ecol. Sociobiol.* 61 371–384.
- Little, A.C., Apicella, C.L., Marlowe, F.W., 2007. Preferences for symmetry in human faces in two cultures: data from the UK and the Hadza, an isolated group of hunter-gatherers. *Proc. R. Soc. London B.* 274, 3113–3117.
- Little, A.C., Jones, B.C., DeBruine, L.M., Feinberg, D.R., 2008. Symmetry and sexual dimorphism in human faces: interrelated preferences suggest both signal quality. *Behav. Ecol.* 19, 902–908.
- Rhodes, G., 2006. The evolutionary psychology of facial beauty. *Annu. Rev. Psychol.* 57, 199–226.

- Simmons, L.W., Rhodes, G., Peters, M., Koehler, N., 2004. Are human preferences for facial symmetry focused on signals of developmental instability? *Behav. Ecol.* 15 864–871.
- Trivers, R.L., Willard, D.E., 1973. Natural selection of parental ability to vary the sex ratio of offspring. *Science* 179, 90–92.
- Wedekind, C., Seebeck, T., Bettens, F., Paepke, A.J., 1995. MHC-dependent mate preference in humans. *Proc. R. Soc. London B.* 260, 245–249.

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Received 4 February 2010

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