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Fluctuating Asymmetry, Metabolic Rate and Sexual Selection in Human Males

J. T. Manning, K. Koukourakis, and D. A. Brodie
Population Biology Research Group, Department of Environmental and Evolutionary Biology (J.T.M. and K.K.), and Department of Movement Science and Physical Education (D.A.B.), University of Liverpool, Liverpool, U.K.

Fluctuating asymmetry (FA), a measure of developmental stability, may be important in human sexual selection, that is in mate choice and male-male competition. It is shown that in males (but not in females) resting metabolic rate (RMR) is positively related to FA. This is explained in terms of the balanced energy equation of males. Sexual selection for large body size (resulting from male-male competition) and low FA (a consequence of mate choice) results in a stress on the provision of energy for growth and the maintenance of symmetry. Viewed in this way, sexual selection is similar to any other stress such as overcrowding and starvation. High-quality males are better able to withstand the stress of sexual selection than low-quality males. The former have "energy-thrifty genotypes" and are able to allocate more energy to growth and reducing FA than the latter.

KEY WORDS: Fluctuating asymmetry; Sexual selection; Metabolic rate.

Fluctuating asymmetry (FA), random deviations from perfect bilateral symmetry, is a negative measure of developmental stability. FA is increased by genetic stress, for example, harmful mutations, homozygosity, directional selection, and environmental stress such as overcrowding and pollution in a wide range of organisms including insects, fish, and mammals (Hartl et al. 1995, Leary and Allendorf 1984; Mitton and Grant 1984; Parsons 1992). Therefore FA has been used to monitor environmental deterioration (e.g., in gorillas, Manning

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Address reprint requests and correspondence to: J. T. Manning, Population Biology Research Group, Environmental and Evolutionary Biology, University of Liverpool, P.O. Box 147, Liverpool L69 3BX, England.

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and Chamberlain 1994) and in studies of mate choice for "good genes" (e.g., in barn swallows, Møller 1992).

In humans it is becoming apparent that FA has an important role in sexual selection. FA has been found to be (1) negatively related to estimates of facial attractiveness (Gangestad et al. 1994), (2) positively related to age of first sexual experience and negatively associated with number of lifetime sexual partners (Thornhill and Gangestad 1994), and (3) a predictor in males of the rate of copulatory orgasms of their sexual partners (Thornhill et al. in press). These findings are consistent with the action of intersexual selection through mate choice.

On the other hand, intrasexual selection tends, through male-male competition, to result in the evolution of such traits as large body size in males. Manning (1995) has shown that bodyweight is negatively associated with FA in human males but positively correlated with FA in females. Weight in males may be condition dependent in that only those males in good condition (and therefore with good genes) can "afford" to grow and maintain large muscles. Large size together with symmetry could be honest signals of strength to potential male opponents. Consistent with this, Gangestad and Thornhill (in press) have confirmed a negative correlation between FA and men's body mass and have also found an association between FA and physicality (a trait that includes ratings of muscularity, robustness, and vigor) and social dominance. The negative association between FA and size in males may therefore result from the action of intrasexual selection through male competition for females. If this argument is correct, it will follow that other indicators of condition will also be negatively related to FA in males but not in females.

Resting metabolic rate (RMR), the metabolic rate of an individual at rest, may be one such indicator of condition. Mitton (1993), in a discussion of the relationship between FA and RMR, has argued that individuals with low RMR will be able to allocate a larger proportion of their energy budget to the maintenance of symmetry than is possible for high-RMR individuals. Therefore, in human males, FA should be positively associated with RMR. That is, individuals who have "energy-thrifty genotypes" are able to develop symmetrically while those who have to expend large amounts of energy in simply maintaining their body will not be able to "afford" to develop symmetrically. The purpose of this paper is to investigate the relationship between RMR and FA and to determine whether RMR is a stronger predictor of FA than body mass.

METHODS

We recorded age and measured FA, RMR weight, and height in 60 subjects (30 males and 30 females). The subjects were students and staff of Liverpool University.

Four bilaterally symmetrical traits were measured: ear height (EH), bistyloid (wrist) breadth (BH), length of second digit (2 DL) and length of fifth digit (5 DL).

As in Manning (1995), the repeatabilities of measurements were high, ranging from $r_1 = .97$ to .99. Absolute FA was calculated as the difference in length between the left and right side of a trait. The presence of directional asymmetry was tested