CHICKENS PREFER BEAUTIFUL HUMANS

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We trained chickens to react to an average human female face but not to an average male face (or vice versa). In a subsequent test, the animals showed preferences for faces consistent with human sexual preferences (obtained from university students). This suggests that human preferences arise from general properties of nervous systems, rather than from face-specific adaptations. We discuss this result in the light of current debate on the meaning of sexual signals and suggest further tests of existing hypotheses about the origin of sexual preferences.

KEY WORDS: Facial attractiveness; Handicap principle; Receiver bias; Sexual selection

A widespread idea about sexual signals is that they provide potential mates with detailed information about the signal bearer's quality as a mate. Signaling of both phenotypic and genetic quality (for instance: lack of genetic defects, a good immune system) has been hypothesized (reviewed in Andersson 1994). The hypothesis goes further in assuming that the natural receivers of a signal (that is, conspecifics of the opposite sex) possess a biological adaptation enabling them to decode the quality information contained in the signal. Such a mate-quality hypothesis has been often embraced in studies on humans (Buss 1999; Cunningham 1986; Perrett et al. 1998; Thornhill and Gangestad 1999) whereas it remains controversial among biologists studying other species (see, e.g., Palmer and Strobeck 1997).

An alternative hypothesis (Enquist and Arak 1998; Ryan 1998) agrees

that receivers get some information from sexual signals, for example about sex and age, but also claims that finer details of receiver preferences are due to biases inherent to nervous systems. For instance, preferences for exaggerated sex-typical traits (Keating 1985; Gillen 1981; Perrett et al. 1998; Rhodes et al. 2000) may follow from how the brain discriminates between the sexes (Enquist et al. 2002). Indeed, it is typical for biases to emerge as a by-product of some discrimination or recognition task. Such biases follow well-known empirical rules which are largely independent of the particular task at hand (that is, whether a discrimination has been solved to obtain food, to escape a danger, or, in humans, simply to comply with the instructions of an experimental psychologist; see Purtle 1973; Mackintosh 1974).

This latter fact suggests a method to distinguish generic biases from preferences shaped by a specific selection pressure. Kobayashi (1999) argued that if the bias hypothesis is correct, similar preferences could develop in any nervous system, given experience with the considered signals. In contrast, the mate-quality hypothesis predicts that preferences are species-specific because they should be tailored to interpret quality cues that differ across species. Kobayashi tested this idea by presenting mynhas *(Gracula religiosa)* with pictures of peacocks *(Pavo cristatus)*, showing that they preferred to approach and peck at the picture representing the peacock with the most magnificent tail. In this paper we report on a similar experiment comparing human sexual preferences for faces with preferences developed by chickens in the course of a face discrimination task.

METHODS

Chickens

Subjects. The experimental animals were six chickens *(Gallus gallus domesticus)*, of which four were females. The animals had experience with the experimental setup (pecking visual stimuli on a computer screen, see below), but not with tasks involving faces.

Stimuli. A set of seven faces (Figure 1a) was obtained as follows. Average male and female faces were obtained by averaging 35 individual pictures of individuals of each sex. These averages are indicated with an arrow in Figure 1a. The middle face was obtained by averaging these two averages. Finally, using graphical manipulation (linear extrapolation based on pixel patterns) we obtained two faces showing exaggerated female traits (shown at the right of the female average in the figure) and two faces showing exaggerated male traits (at the left of the male average). The
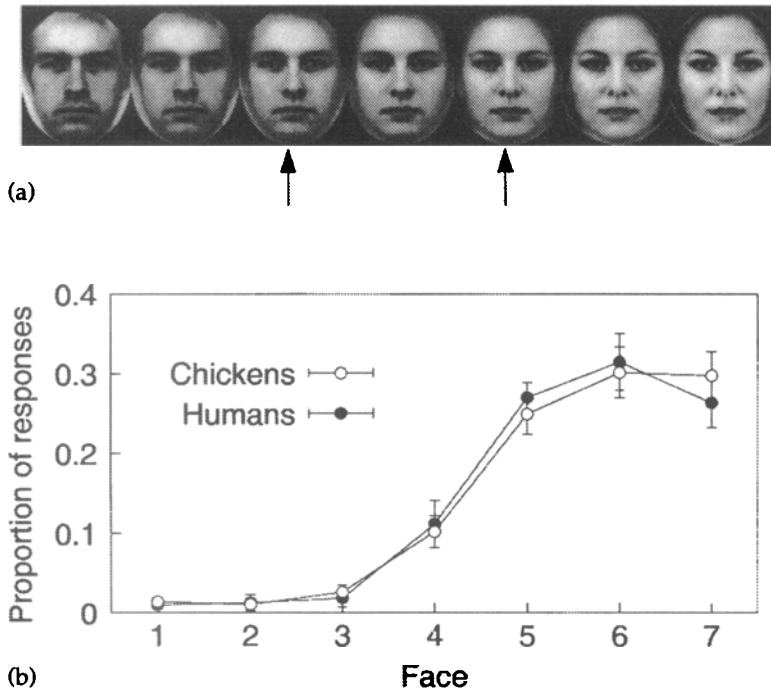
(a)

(b)

Figure 1. *(a)* Faces used in the experiment (see text). *(b)* Average proportions of pecks by chickens in response to the test faces, and human ratings of the same faces. Bars denote SE. Animal data are aligned so that face 3 is the unrewarded face and face 5 the rewarded one. For humans, face 3 is the same-sex average and face 5 the opposite-sex one.

whole set of faces has been reliably rated as increasing in femininity from left to right by human subjects in another study (Enquist et al. 2002).

Training.   During training the animals saw only the average male and female faces. The faces alternated in random order on a touch-sensitive computer screen (with the provision that a face could not appear more than three times in a row). Apart from the face image, the screen was black. Hens were rewarded for pecking at the male face, cocks for pecking at the female face. Pecks at the rewarded face caused the screen to become white while access to food was allowed for 5 seconds. If no pecks occurred within 10 seconds, a new randomly chosen face was shown (after a 2-second interval during which the screen was black). When the unrewarded face was shown, it stayed on the screen until 10 seconds had passed since the last peck. Animals were trained daily excluding week-

ends. Each training session lasted until the subject stopped responding (criterion: about 5 minutes without any pecks) or after about 40 minutes. Animals were motivated by withdrawal of food from their cages 10 to 12 hours before training. Training continued until at least 75% of the total number of pecks was directed to the rewarded face (average of three consecutive sessions). This criterion was reached in an average of 11.5 sessions (range 7–18).

Testing. During testing the presentation of the rewarded and unrewarded faces continued as above, but every seven presentations of the rewarded face a test trial occurred. During a test trial a randomly chosen face from the whole set was shown for 10 seconds, and the number of pecks was recorded. No reinforcement was given on test trials. Testing continued until all animals had received at least four presentations of each of the test faces.

Humans

Subjects. Fourteen undergraduate students in biology (seven females) participated in the study for course credit.

Stimuli. Same as for the chickens.

Training. Human subjects received no training. Rather, they were shown the faces in Figure 1a once, in random order, immediately before the test.

Testing. The students were asked to rate, in random order and on a scale from 0 to 10, all seven faces according to how desirable it would be to go on a date with the portrayed person. Each face was shown alone on a computer screen, until the subject rated it. The total scores assigned to each face were transformed into relative scores, which allowed comparison with animal data.

RESULTS AND DISCUSSION

Figure 1b shows the test results in the form of a generalisation gradient over the whole face set. Human and chicken behavior was almost identical (correlation between the two gradients: $r^2 = 0.98$). Moreover, chicken and human data for each face never differed significantly (two-sample t-tests, $N_1 = 6$, $N_2 = 14$, p values between 0.35 and 0.98). The response gradients in Figure 1b are as expected based on our general knowledge about learning and memory, simply based on the fact that a discrimination between stimuli has been established (Mackintosh 1974; Enquist et al. 2002). The agreement between chickens and humans is a further argument to

conclude that no deviation from these general rules is present in our human data. Thus, the results do not require the assumption of face-specific adaptations in humans.

We cannot of course be sure that chickens and humans processed the face images in exactly the same way. This leaves open the possibility that, while chickens use some general mechanism, humans possess instead a specially evolved mechanism for processing faces. We cannot reject this hypothesis based on our data. However, there are at least two reasons why we do not endorse this argument. First, it is not needed to account for the data. We believe that the existence of a task-specific adaptation can be supported only with proofs for it, rather than with absence of proofs against. Second, the evolutionary logic of the argument is weak. From observed chicken behavior and knowledge of general behaviour mechanisms we must in fact conclude that humans would behave the same way with or without the hypothesized adaptation. There would thus be no selection pressure for developing one.

Our experiment can be developed in several ways. For instance, we have trained chickens to distinguish between two faces only, while humans have experience of many more faces. To partially compensate for this difference in experiences we have used average faces, which encode the characteristics of many individuals. Nevertheless, it is certainly desirable to extend our results by training animals to discriminate between the sexes based on individual faces. This would also allow tests for preferences with a wider set of faces. Moreover, faces of children and old people could also be employed as unrewarded stimuli to better approximate human experiences and investigate preferences with respect to age. If the bias hypothesis is correct, closer and closer approximation of human experience should lead to better agreement between animals and humans with larger sets of faces than the one used here. On the contrary, if systematic differences between humans and animals emerge, and if the human criteria are found to match actual mate quality, the mate-quality hypothesis will receive support.

Ours is of course a preliminary study. We believe, however, that it shows the potentials of the comparative study of preferences. This method is not only relevant to the study of human faces, it can be applied to any communication system to evaluate whether its evolution has favored information transfer or rather is a product of receiver biases.

Stefano Ghirlanda recently defended his Ph.D. thesis, "Towards a Theory of Stimulus Control," dealing with widespread behavioral phenomena such as generalization and learning, in both animals and humans. His other research interests include the evolution of communication systems and the role of behavior mechanisms in social evolution.

Liselotte Jansson is a Ph.D. student developing empirical techniques to test theories about the evolution of communication using live animals. Her current projects seek to investigate the emergence during evolution of common characteristics of visual signals such as symmetry and saturated colors. Her empirical studies also include research on cognitive development in preschool children.

Magnus Enquist, professor of ethology, has worked to understand the evolution of social behavior in animals, especially with respect to aggressive communication and sexual selection. He has an increasing interest in human social behavior, particularly in applying our knowledge of biological evolution to humans without neglecting the peculiarities of the species.

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