

Do Mynahs prefer Peacock feathers of more regular pattern?

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Abstract

The “sensory exploitation hypothesis” and the “quality assessment hypothesis”, aimed at explaining female preferences of symmetrical male sexual ornaments, were tested on Mynahs. In the first experiment, two birds were allowed to select between two abstract patterns, one regular and one irregular. The birds preferred the regular patterns but only significantly so in one individual. In the other experiment two other Mynahs were allowed to select between two images of male Peacock tails, a sexual

ornament of an unrelated species. Both birds showed a significant preference for the image with a more regular Peacock tail. The results are discussed in the light of the limited sample size. The value of the technique to separate between the hypotheses of female preference for symmetric male characters is discussed.

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Introduction

Female preferences for symmetrical male traits have been demonstrated or suggested in various animals including earwigs (Radesäter & Halldórsdóttir 1993), crickets (Simmonds & Ritchie 1996), Swallows (Møller 1993), Zebra Finches (Swaddle & Cuthill 1994), Peahens (Thornhill & Gangestad 1993) and Humans (Berlyne 1971). These preferences have been explained mainly by the honest advertisement hypothesis or handicap principle (Zahavi 1975) which says that symmetry preference may have evolved specifically because symmetry reflects male genetic quality.

On the other hand, some researchers (Enquist & Arak 1993, Enquist & Arak 1994, Johnstone 1994) have recently indicated the possibility of evolution of symmetrical ornament by sensory exploitation hypotheses. Enquist & Arak (1994) showed that, when neural networks and patterns stimulating it were gradually changed by mutation (that is, coevolution) so that they produce best discrimination of stimulus patterns from other patterns (that is, best recognition of the stimulus pattern), the stimulus pattern became symmetrical. These results mean that females' preference for symmetrical traits of males can evolve from the general nature of object or

mate recognition mechanism even in the absence of any link between symmetry and quality.

The idea by Enquist & Arak and Johnstone (I call it the “general perceptual nature” hypothesis) seems to be consistent with results of Rensch's studies (1957, 1958). Rensch presented a Capuchin Monkey, a Long-tailed Monkey, a Carrion Crow, and five Jackdaws with pairs of eight cards: each pair comprised a symmetrical or regular pattern on one card and an irregularly shaped pattern (but containing about the same quantity of black) on the other (Figure 1A). He found that, with relatively few exceptions, these animals definitely chose (took by hand or beak) the regular patterns to the irregular ones. From the “general perceptual nature” hypothesis, Rensch's results may be interpreted as follows. Experimental monkeys and birds could easily recognise regular patterns including symmetry, and prefer to approach them rather than irregular patterns.

One of the problems in applying such a “general perceptual nature” hypothesis in actual mate choice event seems to be whether the disposition to prefer more symmetrical patterns which was indicated through the simulation by artificial neural networks and the experiments by Rensch can really work with actual visual patterns on the ornaments of male

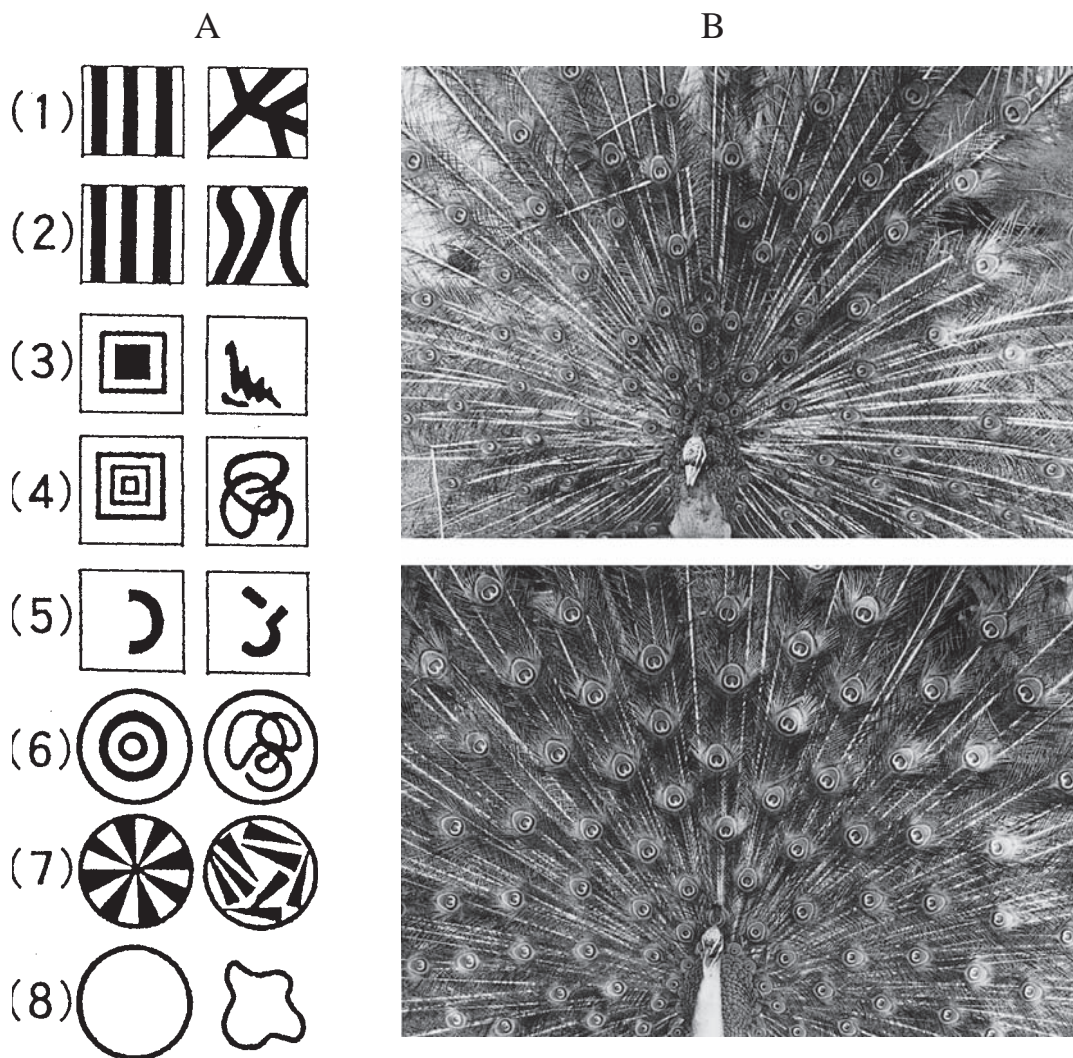


Figure 1. A) Cards of regular patterns (left-hand column) and irregular patterns (right hand column) used in the preliminary experiment and by Rensch (1957) to examine the pattern preference by some kinds of animals. This figure is after Rensch (1957). B) Photographs of sexually-displayed tail feather of Peacock used in the essential experiment. Eyespots in the lower feather are more orderly arranged than eyespots in the upper one. Actual photographs for the experiment were in colour. C) The procedure of presentation of a pair of photographs of Peacock feathers to Mynahs. A pair of photographs were placed on the side of the floor of a Mynah rearing cage in the absence of the Mynah, after which the Mynah was put on the perch on the opposite side to the presented photographs (picture a). The Mynah approached the photographs and pecked at one in the pair (picture b).

A) Par av kort med regelbundna (vänstra kolumnen) och oregelbundna mönster (högra kolumnen) vilka användes i det preliminära experimentet och av Rensch (1957) för att undersöka preferenser hos djur. Figuren är från Rensch (1957). B) Fotografier av utfällda påfågelstjärtar som användes i huvudexperimentet. Ögonfläckarna är mer regelbundet placerade i den undre bilden jämfört med den övre. De använda fotografierna är i färg. C) En illustration som visar hur fotografierna på påfågelstjärtar visades för beostarna. Ett bildpar placerades på golvet lutandes mot väggen medan buren var tom. Därefter placerades beostaren på sittpinnen mitt emot bilderna (bild a). Fågeln hoppade ner mot bilderna och pickade på en av bilderna i paret (bild b).

C



Swallows, Zebra Finches, and Peacocks. To explore this problem, I performed two simple experiments (preliminary experiment and essential experiment) using four Mynahs.

Methods

Preliminary experiment

Two wild-type hill Mynahs *Gracula religiosa* were presented with 8 pairs of cards (5x5 cm) of the black-and-white patterns as in Figure 1A, to examine their general preference for regularity. The Mynahs were obtained from a breeder when they were a few months old, then separately reared in the cages (60x36x45cm) and used for the experiment at the age of 5 – 12 months. A pair of cards was presented to each Mynah by the following procedure. The Mynah was removed from the rearing cage, and two cards were placed on the side of the floor of the rearing cage about 3 cm apart, with placement sides chosen randomly. Then, the Mynah was put on the perch that was set on the side opposite to the presented cards. The Mynah, after spending several or a few tens of seconds on the perch, went down on the floor and approached the cards and pecked (or picked up by beak) one of the cards. In each trial, I recorded which card was first pecked (or picked up) after the presentation. The trials were performed within 06:00–08:00 of June–September (summer period) of 1996, and at least one day intervened between trials for each Mynah.

Essential experiment

The experiment was performed with colour photographs of the ornamental feathers of Peacocks *Pavo cristatus*, and two Mynahs other than the ones used in the preliminary experiment. The procedure of the experiment and the age and history of the Mynahs at the point of experiment were almost the same as in the preliminary experiment. The photographs of the tails of sexually-displaying Peacocks were taken in the Peacock Park of Shodosima Island of Japan. A pair of photographs (13x9 cm) (Figure 1B), one of which shows well ordered arrangement of eye-like spots on the feather and the other of which shows a less ordered arrangement, were presented to each Mynah in its rearing cage. After several or a few tens seconds from the presentation, Mynahs pecked (or picked up by beak) either of photographs (Figure 1C). The trials were performed within 06:00–08:00 of June–September of 1997, and at least one day intervened between trials for each Mynah.

Table 1. Number of peckings to regular and irregular patterns on the cards in Figure 1A.

Antal pickningar på regelbundna och oregelbundna mönster på korten i Figur 1A.

Subject <i>Individ</i>	Pattern <i>Mönster</i>	Card-pair No. <i>Kortpar Nr.</i>								Binomial test (one-tailed)
		1	2	3	4	5	6	7	8	<i>Binomial test (ensvansad)</i>
Bird 1 <i>Fågel 1</i>	Regular <i>Regelbundet</i>	18	19	12	18	6	10	12	19	} $P < 0.05$
	Irregular <i>Oregelbundet</i>	4	7	5	3	9	8	8	5	
Bird 2 <i>Fågel 2</i>	Regular <i>Regelbundet</i>	14	12	10	11	11	4	6	16	} $P = 0.14$
	Irregular <i>Oregelbundet</i>	3	2	3	4	7	12	15	8	

Results and Discussion

Preliminary experiment

One of the two Mynahs selected the cards with regular patterns significantly more often than the ones with irregular patterns ($P < 0.05$), and the other Mynah selected cards with regular patterns more often ($P = 0.14$, Table 1). Although the results are from only two individuals, they indicate the possibility that Mynahs prefer regular visual patterns. The result that one of the two Mynahs did not show a preference for the regular pattern in the card-pairs (5), (6), and (7), may indicate that the bilateral

symmetry is an important factor in the regularity selection by Mynahs for the following reasons. The absence of the regular pattern preference in (5) may be because neither of right and left patterns of (5) are bilaterally symmetric, and in (6) and (7) it may be because the right (irregular) patterns of (6) and (7) look somewhat bilaterally symmetric for their conspicuous regular circles of the outside frame.

Essential experiment

Both Mynahs showed a significant preference for the photograph of the more regular Peacock tail in

Table 2. Number of peckings to photographs of Peacock tail feathers with different regularity (Figure 1B).

Antal pickningar på fotografier av Påfågelstjärtar med olika grad av regelbundenhet (Figur 1B).

Subject <i>Individ</i>	Peacock tail feathers <i>Påfågelstjärtar</i>		Binomial test (one-tailed) <i>Binomial test (ensvansad)</i>
	More regular pattern <i>Mer regelbundna</i>	Less regular pattern <i>Mindre regelbundna</i>	
Bird 3 <i>Fågel 3</i>	20	8	$P < 0.05$
Bird 4 <i>Fågel 4</i>	17	5	$P < 0.01$

Figure 1B (Table 2). It is impossible to determine, from the result, what factor in the ornament in the lower photograph the Mynahs preferred. However, it seems most probable that the critical factor is the degree of regularity of the arrangement of eye-like spots and/or stalks of feathers, when considering the following facts. (1) Test colour photographs were selected so that the difference between factors other than the regularity, such as the size and the lightness of eye-like-spots, and the angle of feathers, were minimized between them. (2) The preliminary experiment indicates a possibility that Mynahs prefer regular patterns to irregular ones.

It can not be concluded that the preference for Peacock ornaments of more regular pattern is common and stable phenomenon in Mynahs because the sample size of experimental Mynahs and experimental photographs of Peacock feathers is too small, but the result certainly shows the possibility.

Experimental technique for "quality assessment hypothesis" vs. "general perception hypothesis"

The present study can not be fully evaluated without using more experimental Mynahs and various photographs of Peacock feathers. However, it shows that the technique to present Mynahs with Peacock ornament photographs is a good method to distinguish the "quality assessment hypothesis" from the "general perception hypothesis". If Mynahs prefer more regular patterns of Peacock ornaments, which is suggested in the present study, the "general perception hypothesis" is in favour. If the sexual signals of one species are judged attractive by other species on the basis of symmetry or regularity, it is reasonable to think that the general perceptual nature plays more important roles in mate choice than the genetic quality assessment.

This technique could also be used in other species where the quality assessment is regarded as an important factor in the mate choice.

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Sammanfattning

Föredrar beostarar mer regelbundna påfågelstjärter?

Två hypoteser har presenterats som möjliga förklaringar till varför honor av flera arter föredrar hanar med de mest symmetriska sexuella ornamenten. Hypotesen om kvalitetssignalering menar att de sexuella ornamenten återspeglar hanens genetiska kvalitet, ju mer symmetri, desto bättre gener. Teorin om sensorisk exploatering menar istället att honor föredrar symmetriska ornament för att dessa ger starkare stimulans av det sensoriska systemet. Känsligheten för symmetriska mönster anses ha uppkommit som en biprodukt av igenkänningen av den egna arten.

De två teorierna testades mot varandra genom att beostarar *Gracula religiosa* fick genomgå två test. I det första experimentet fick två beostarar välja mellan två kort, ett med regelbundet och ett med oregelbundet mönster. Åtta par kort presenterades parvis (Figur 1A). De två testade beostararna visade preferens för korten med de regelbundna mönstren, men preferensen var bara signifikant för den ena fågeln (Tabell 1).

I det andra testet användes två andra individer av beostare. Deras preferenser för regelbundna mönster testades på två bilder av sexuella ornament hos en annan art, påfågel *Pavo cristatus* (Figur 1B). I detta

(och föregående experiment) testades preferensen genom att räkna antalet pickningar mot, och upplöckningar av korten (Figur 1C). Bägge individerna prefererade bilden med det mer regelbundna mönstret (Tabell 2). För att kunna uttala sig generellt om beostarens preferenser av symmetriska ornament

hos andra arter behöver det senare experimentet upprepas med både fler individer av beostare och fler bild-par på sexuella ornament. Resultaten från detta preliminära experiment är dock lovande och visar på en teknik med vilken de två hypoteserna för preferens av symmetriska ornament kan skiljas åt.