Symmetrical decorations enhance the attractiveness of faces and abstract designs

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Abstract

In humans and several other species, face and body symmetry have been found to enhance physical attractiveness. A proposed explanation is that symmetry is a phenotypic indicator of biological fitness. Throughout the world, symmetrical designs also are a common feature in face and body painting and the decorative arts. The implication is that symmetrical designs might provide an additional way to enhance physical attractiveness. To find out, we conducted three experiments, two with human faces and one with abstract or nonrepresentational designs. In Experiments 1 and 2, we showed undergraduate students photographs of pairs of faces and instructed them to choose the more attractive face in each pair. The photographs were of physically symmetrical and asymmetrical faces (as indexed by facial features) that had been decorated with either symmetrical or asymmetrical designs of the kind used in many preindustrial societies. As indexed by the number of times they were chosen, symmetrical faces were judged to be more attractive than asymmetrical faces; adding asymmetrical designs to symmetrical faces decreased their attractiveness; and adding symmetrical designs to asymmetrical faces increased their attractiveness. In Experiment 3, undergraduates made similar choices from pairs of abstract designs taken from several cultures and modified in shape, coloration, and orientation of design features. Symmetrical designs again were judged to be more attractive, with shape and coloration playing the more important roles. We interpret the results as

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suggesting that the same mechanisms underlying the judgment of physical attractiveness also underlie cultural practices of face painting and abstract art.
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1. Introduction

...[T]he eye prefers symmetry or figures with some regular recurrence. Patterns of this kind are employed by even the lowest savages as ornaments; and they have been developed through sexual selection for the adornment of some male animals.

Fig. 1. Examples of symmetrical face painting. (A) Selk’nam (South America), (B) Huli (Papua New Guinea), (C) Kikuyu (Africa), (D) Blackfoot (North America). Panel A is from Gusinde (1982) and panels B–D are from Gröning (2002) (Reprinted with permission).
Face and body painting are among the earliest forms of human art (Mithen, 1996; Power, 1999). One of their most striking and common features is the use of symmetrical designs (e.g., Boas, 1955; Brain, 1979; Ebin, 1979; Gusinde, 1982). Examples are shown in Fig. 1. Symmetrical designs also are widely seen in the decorative arts (Gombrich, 1984; McManus, 2002; Washburn & Crowe, 1988; Weyl, 1952).

This common use of and implied preference for symmetry in face and body painting and the decorative arts could be acquired through cultural processes, but that cannot be the whole story. One reason is that many cultures showing the preference are temporally and geographically isolated (Lévi-Strauss, 1963). Another reason is that symmetry is perceptually salient in human visual processing as indicated by its rapid and accurate detection in adults (Evans, Wenderoth, & Cheng, 2000; Julesz, 1971; Tyler, 2002; Wagemans, 1999; Wenderoth, 1994), its prominence in memory (Attneave, 1955; Deregowski, 1972), and its high signal value even for infants (Bornstein, Ferdinasen, & Gross, 1981). Preference for symmetry also appears to be unaffected by learning (Rentschler, Jüttner, Unzicker, & Landis, 1999; Washburn & Humphrey, 2001). Finally, facial symmetry has the same effect in a variety of cultures: to enhance physical attractiveness (Grammer & Thornhill, 1994; Hume & Montgomerie, 2001; Jones et al., 2001; Koehler, Rhodes, & Simmons, 2002; Little, Burt, Penton-Voak, & Perrett, 2001; Mealy, Bridgestock, & Townsend, 1999; Penton-Voak et al., 2001; Perrett et al., 1999; Rhodes, Proffitt, Grady, & Sumich, 1998; Rhodes, Yoshikawa, et al., 2001; Rhodes, Zebrowitz, et al., 2001). Collectively, the evidence suggests that the preference for symmetry, while perhaps acquirable through cultural processes, is rooted more fundamentally in our evolutionary history. If so, it further suggests that the preference is an adaptive trait, perhaps related to sexual selection, as Darwin (1882) proposed.

Given the ubiquity of symmetrical designs, the salience of symmetry in vision, its effects on facial attractiveness, and the possibility that the preference is adaptive, we were curious to know whether symmetrical designs, namely, decoration in the form of facial paint, can enhance the attractiveness of faces, that is, make them more attractive than they would be otherwise, and, likewise, whether symmetry can enhance the attractiveness of abstract designs. To find out, we conducted three experiments, the first two with faces, the third with abstract designs.

2. Experiment 1

In Experiment 1, with faces, we began with the realization that if facial attractiveness can be enhanced by symmetrical facial paint, the effect could either depend on or be independent of the attractiveness of the faces themselves. For instance, symmetrical paint could enhance the attractiveness of symmetrical faces by making the symmetrical features more salient and therefore more easily perceived; it could enhance the attractiveness of asymmetrical faces by making their asymmetrical features look more symmetrical; and it could enhance attractiveness independently of facial features by enhancing the attractiveness of all kinds of faces, whatever their degree of asymmetry. If the preference for symmetry is adaptive and related to sexual selection, then enhancement effects also could depend on the sex of the person judging the faces as well as the sex of the faces being judged. The literature on symmetry provides
several examples of a sex-related effect, including reports that symmetry affects attractiveness judgments more strongly for faces of the opposite than the same sex as the person judging the faces, in other words, for faces that are mate-relevant (Little et al., 2001; Penton-Voak et al., 2001), and that for both men and women, ratings of perceived health are more strongly correlated with symmetry of opposite- than same-sex faces (Jones et al., 2001).

To address these different possibilities, we asked men and women to judge the attractiveness of symmetrical and asymmetrical faces of both sexes decorated with either symmetrical or asymmetrical facial paint.

2.1. Materials and methods

2.1.1. Subjects

The subjects were undergraduate students from the Universidad de Magallanes, Chile: 20 men (18–25 years old) and 20 women (18–26 years old). Subjects were recruited from public areas of the university.

2.1.2. Faces

The faces were produced from digital images of 16 faces, all of young adults (8 male and 8 female), all with naturally asymmetrical facial features, selected from the AR database (Martinez & Benavente, 1998). All were frontal view faces with “neutral” expression, standard illumination, and a resolution of 768×576 pixels and 24 bits of depth. Faces were resized, translated, and rotated to a standard center position.

Following the method used by Rhodes et al. (1998), we manipulated each image to produce 16 faces with symmetrical features. We did this as follows: from each of the original asymmetrical 16 faces, we created two chimeric faces (mirror reflections of the face’s right and left sides). We then “averaged” each pair of chimeric faces into a new face by manually placing 145 points on each chimera to indicate the location of the facial features to be averaged using morphing software, WinMorph 3.01. This procedure yielded 16 new “average faces” with perfectly symmetrical features. Finally, using Corel PhotoPaint 9, we manually retouched each new face to have the same hairstyle, visible clothing, and skin texture as the original face. Together, the 16 symmetrical faces and the 16 original faces made a total of 32 faces.

To each of the 32 faces, we then manually applied two designs of facial paint, one symmetrical and the other asymmetrical, using a reference mask containing the pixel coordinates of the areas to be painted. The symmetrical design consisted of a central white square on the bridge of the nose and a black horizontal stripe on each cheek with a white circle to the outside. To produce the asymmetrical design, we vertically displaced the stripe and circle on one side by 3 mm (10 pixels).

2.1.3. Experimental conditions

We used a within-subjects design with the variables symmetry of paint (two levels: symmetrical paint, asymmetrical paint), symmetry of face as indexed by facial features (two levels: symmetrical features and asymmetrical features), and sex of face relative to sex of subject (two levels: same sex and opposite sex) (Fig. 2).
In Condition 1, a symmetrical face decorated with symmetrical paint (Face A) was paired with an asymmetrical face decorated with asymmetrical paint (Face C). In Condition 2, an asymmetrical face with symmetrical paint (Face D) was paired with a symmetrical face with asymmetrical paint (Face F). For half the subjects, the faces for Conditions 1 and 2 were reversed.

To check whether, as in prior reports, faces with symmetrical features are judged as more attractive, we added a control condition, Condition 3, consisting of pairs of unpainted symmetrical and asymmetrical faces (Faces J and K).

Each of the three conditions consisted of eight trials, so that each subject judged a total of 24 face-pairs. The eight trials included four trials of four different pairs of male faces and four trials of four different pairs of female faces. Total preference scores for each condition (i.e., the total number of judgments, or choices, of the more symmetrical face of each pair as
the more “attractive”) therefore could range from 0 to 8 (0–4 for face-pairs of the same sex as the subject and 0–4 for face-pairs of the opposite sex as the subject). Across conditions for both groups of subjects, the faces comprising each pair were left–right counterbalanced for position of the faces with symmetrical and asymmetrical features and for position of the faces with symmetrical and asymmetrical paint.

2.1.4. Procedure

Subjects were instructed to “choose the face that is physically more attractive in each pair of faces.” Before starting, subjects were given five practice trials using faces with and without facial paint (no faces from the experimental set were included). Faces were presented on an LCD screen (215×285 mm) of a laptop computer. Subjects were tested individually in a quiet room. They triggered the image presentation by a keypress and advanced the series of images at their own pace. All completed the session in about 10 min.

2.2. Results

Table 1 shows that for the control condition (3), with unpainted faces, symmetrical faces were preferred or judged to be more attractive than asymmetrical faces, as indicated by the finding that the mean number of symmetrical faces chosen was significantly greater than chance [all t tests reported in this article were tested against chance, \( t(39)=3.6, p=.001 \)]. A mixed factorial ANOVA showed that although men and women alike chose symmetrical faces more often, the margin of preference was greater for women \([ F(1,38)=4.6, p=.04] \) and that for all subjects, the preference score was unrelated to the sex of the face \([ F(1,38)=1.6, p=.21] \) or to whether it was the same as or different from the sex of the subject \([ F(1,38)=0.02, p=.89] \).

<table>
<thead>
<tr>
<th>Condition</th>
<th>Paint</th>
<th>Mean (S.D.)</th>
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<tbody>
<tr>
<td>Condition 1</td>
<td>Symmetrical vs. Asymmetrical</td>
<td>6.0 (1.7)</td>
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<tr>
<td>Condition 2</td>
<td>Symmetrical vs. Asymmetrical</td>
<td>4.8 (2.2)</td>
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<tr>
<td>Condition 3</td>
<td>Symmetrical vs. Asymmetrical</td>
<td>5.8 (1.5)</td>
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Table 1
The effect of symmetry of paint on facial attractiveness: Mean number (S.D.) of faces judged as more attractive in each condition (8 trials/condition, \( n=40 \))

*In all three conditions, the symmetrical faces were preferred at above chance level, where chance is equal to 4.*
For the 2×2 symmetry of face by paint conditions, a mixed factorial ANOVA showed a significant effect across conditions for the variable symmetry of paint \[ F(1,38)=6.8, p=.01 \], indicating that symmetrical faces with symmetrical paint were the most attractive; that applying an asymmetrical design to a symmetrical face decreased its attractiveness; and that asymmetrical faces with symmetrical paint were more attractive than asymmetrical faces with asymmetrical paint. Symmetrical paint alone, however, did not guarantee that a face would be judged as the more attractive. In Condition 2, the mean preference score for symmetrical faces still exceeded chance \[ t(39)=2.3, p=.02 \], indicating that when faces were painted, the degree of symmetry of their physical features still influenced the subjects’ judgments.

Neither the sex of the subject nor whether it was the same as or different from the sex of the faces influenced the faces’ perceived attractiveness \[ no main effect for sex of subject, F(1,38)=0.3, p=.59, \] and no interactions between sex of subject and sex of face, \[ F(1,38)=0.01, p=.92 \], and this was so whether the face painting was symmetrical or asymmetrical \[ F(1,38)=0.2, p=.63 \]. Symmetrical paint, however, enhanced facial attractiveness more for faces of the opposite than the same sex as the subject \[ significant interaction between the variable symmetry of paint, sex of subject, and sex of face, F(1,38)=4.2, p=.04 \].

2.3. Discussion

Our results are consistent with those from a wide range of studies showing that more symmetrical faces are more attractive than less symmetrical faces (Grammer & Thornhill, 1994; Hume & Montgomerie, 2001; Jones et al., 2001; Koehler et al., 2002; Little et al., 2001; Mealy et al., 1999; Penton-Voak et al., 2001; Perrett et al., 1999; Rhodes et al., 1998; Rhodes, Yoshikawa, et al., 2001; Rhodes, Zebrowitz, et al., 2001; Scheib, Gangestad, & Thornhill, 1999). They also show that facial attractiveness can be enhanced by symmetrical facial paint and reduced by asymmetrical facial paint. To our knowledge, this is the first experimental demonstration of this effect. Finally, our results show that regardless of whether the paint is symmetrical or asymmetrical, subjects’ judgments are more affected by feature symmetry and more for faces of the opposite than the same sex as their own.

A possible problem with our method of producing symmetrical faces is that it might have yielded faces with smoother skin texture than the original face, meaning that our manual retouching method did not sufficiently reduce the differences in skin texture between the original and symmetrical faces. If so, it raises the possibility that preferences for symmetrical faces were confounded with preferences for faces with smoother skin texture. Even if that happened, we do not think it would have weakened the obtained effects of the symmetrical facial paint on attractiveness because we manipulated symmetrical faces in the same way across experimental conditions. That would mean that the changes in the attractiveness of symmetrical faces can be attributed only to the concomitant changes in the symmetry of paint. But to be sure, we conducted a second experiment, Experiment 2, to see whether our results remained the same for faces with identical skin texture. To compare the effect of degree of difference in symmetry on perceived attractiveness, we also created two levels of asymmetrical designs, one matching that in Experiment 1 (high asymmetry) and one with half that level (low asymmetry).
3. Experiment 2

3.1. Materials and methods

3.1.1. Subjects

The subjects were undergraduate students from Michigan State University recruited from undergraduate psychology and linguistic classes. Half the subjects were assigned to the high-asymmetry group, which judged faces with high-asymmetry designs, and half were assigned to the low-asymmetry group, which judged faces with low-asymmetry designs. The high-asymmetry group included 20 men (20–23 years old) and 20 women (18–23 years old); the low-asymmetry group included 20 men (18–24 years old) and 20 women (18–22 years old).

3.1.2. Faces

We selected 32 faces (16 male and 16 female) from the AR database. Faces were resized and rotated to a standard center position. To make the skin texture identical, we manipulated the facial features and skin texture of each face using methods similar to those described elsewhere (Perrett et al., 1999; Rhodes, Zebrowitz, et al., 2001). First, we recorded the position of the facial features of each original face by manually placing 304 reference points on each image. For each original face, we then created left and right chimeras and, using a computer script, placed 304 points on each chimerical face. A morphing software, WinMorph 3.01, used this information to produce 32 synthetic skin textures by averaging (morphing) each pair of chimerical faces. The software then produced 32 asymmetrical faces by remapping (warping) each synthetic skin texture to fit the asymmetrical features of each original face (as indicated by the 304 reference points). A symmetrical version of each face was created with an additional computer script that calculated the average position \((x, y)\) of feature points of each original face, and then used this information to remap the synthetic skin to fit the symmetric (averaged) facial features. All symmetrical and asymmetrical faces were manually retouched to have the same hairstyle and visible clothing.

To each of the 64 faces, we applied three designs of facial paint: symmetrical, high asymmetry, and low asymmetry. As in Experiment 1, we created these designs using a reference mask containing the pixel coordinates of the areas to be painted in each face. To produce designs with high asymmetry, we again displaced the black horizontal stripe and white circle on one side of the design by 3 mm (10 pixels), and to produce designs with low asymmetry, we displaced the same elements by 1.5 mm (5 pixels). Using this method, 192 faces were produced: 64 with symmetrical designs, 64 with low-asymmetry designs, and 64 with high-asymmetry designs.

3.1.3. Experimental conditions

Subjects in the high- and low-asymmetry groups were asked to judge faces that had been manipulated according to three experimental conditions as shown in Fig. 3.

Each of the three experimental and one control conditions consisted of eight trials (four trials of male faces and four trials of female faces), so that each subject in the
high-asymmetry group judged a total of 24 face-pairs, and each subject in the low-asymmetry group judged a total of 32 face-pairs. Total preference scores for each condition therefore could range from 0 to 8 (0–4 for same-sex pairs and 0–4 for opposite-sex pairs). Stimulus presentation was left–right counterbalanced for symmetry of faces, symmetry of paint, and sex of faces.
3.1.4. Procedure

As in Experiment 1, we asked the subjects to judge the attractiveness of symmetrical and asymmetrical faces of both sexes decorated with either symmetrical or asymmetrical facial paint. With the new condition added, subjects completed the session in about 15 min.

3.2. Results

3.2.1. High-asymmetry group

The results for the high-asymmetry group are summarized in the left half of Table 2. A mixed factorial ANOVA for Conditions 1 and 2 showed a significant effect for symmetry of paint \( F(1,38)=17.65, p<.001 \), indicating that symmetrical paint enhanced facial attractiveness while asymmetrical paint decreased attractiveness to the extent that symmetrical faces were no longer preferred when decorated with asymmetrical paint \( t(39)=-0.36, p=.72 \). Symmetrical paint also affected the attractiveness of male faces more than female faces \( F(1,38)=10.05, p=.003 \), and this was true both for men’s and women’s judgments across conditions \( F(1,38)=0.18, p=.68 \).

The results for Condition 3 showed that asymmetrical faces with symmetrical paint were considered more attractive than asymmetrical faces with asymmetrical paint \( t(39)=4.91, p<.001 \). Finally, whether the sex of each pair of faces was the same as

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<th>Table 2</th>
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<td>The effect of symmetry of paint on facial attractiveness</td>
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<tr>
<td>Face</td>
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<td>Condition 1</td>
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<td>Condition 4</td>
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or different from the sex of the subject did not influence their perceived attractiveness \[F(1,39)=0.69, p=.41].

3.2.2. Low-asymmetry group

The results for the low-asymmetry group are summarized in the right half of Table 2. They showed that, for the undecorated faces, symmetrical faces were more attractive than asymmetrical faces \[t(39)=5.6, p<.001\], and a mixed factorial ANOVA showed that the score was not affected by sex of face, sex of subject, or by whether sex of face was the same as or different from sex of subject (all \(p\geq.09\)).

As in the high-asymmetry group, a mixed factorial ANOVA showed a significant effect for symmetry of paint \[F(1,38)=3.8, p=.05\], indicating that symmetrical paint enhanced facial attractiveness while asymmetrical paint decreased attractiveness. Again, symmetrical paint affected the attractiveness of male faces more than female faces \[F(1,38)=7.9, p=.008\], with men and women alike showing the effect (all \(p\geq.41\) for interactions with sex of subject).

Asymmetrical faces with symmetrical paint were not considered significantly more attractive than the same faces with asymmetrical paint \[t(39)=1.8, p=.08\]. A mixed factorial ANOVA showed that attractiveness judgments were not significantly affected by sex of face, sex of subject, or whether sex of face was the same as or different from sex of subject (all \(p\leq.12\)).

3.3. Discussion

The results of Experiment 2 confirm again that faces with more symmetrical facial features are judged as more attractive and that facial attractiveness is enhanced by symmetrical facial paint and reduced by asymmetrical facial paint. They also suggest that the smoother skin texture of the faces in Experiment 1 had enhanced attractiveness slightly but not significantly.

These results also confirm that symmetrical facial paint can enhance the attractiveness of the same face. However, the influence of symmetry of paint on attractiveness is modulated by the degree of asymmetry of the paint: attractiveness of the same face was significantly affected in the high asymmetry condition but not in the low asymmetry conditions (although faces with symmetrical paint were chosen more often than faces with asymmetrical paint).

Finally, the results showed that the magnitude of the effect of decoration on attractiveness depends on the sex of the face, male faces being more affected than female faces by symmetrical decoration. Because we did not find this effect in Experiment 1, this result must be regarded with caution.

4. Experiment 3

In the Introduction, we cited the widespread use of symmetrical designs in the decorative arts as one piece of evidence for an evolved preference for symmetry. Further evidence comes
from studies showing positive correlations between the perceptual salience of symmetrical designs and the aesthetic preference for these designs (Eisenman & Gellens, 1968; Jacobsen & Höfel, 2001; Rentschler et al., 1999; Washburn & Humphrey, 2001), as well as positive correlations between bilateral symmetry about a vertical axis (i.e., left–right symmetry), the kind most salient to the human visual system (Evans et al., 2000; Wenderoth, 1994), and preference for bilaterally symmetrical stimuli, a preference that does not seem to change after training (Rentschler et al., 1999; Washburn & Humphrey, 2001). The fact that symmetry is perceptually salient, however, does not necessarily mean that symmetry will always enhance attractiveness. For instance, under some circumstances, asymmetry might be preferred because, being visually less redundant than symmetry, it looks more “complex” (Berlyne, 1971; Krupinski & Locher, 1988).

If the design of the visual system is sufficient to account for the preference for symmetry, one would not expect symmetry to be preferred when the stimuli are not salient to “bottom-up” mechanisms of symmetry detection. In Experiment 3, we tested this prediction by examining adults’ preferences for abstract designs varying in three kinds of symmetry: shape, color, and axis of symmetry. If bottom-up mechanisms can fully account for the preference, we can predict the following: (a) because symmetrical stimuli are detected fast and accurately, stimuli with a symmetrical shape should be preferred to stimuli with an asymmetrical shape; (b) because color, unlike monochromatic stimuli, has not been found to enhance fast symmetry detection (Morales & Pashler, 1999), preferences for symmetrically colored stimuli should be random; and (c) because left–right, or vertical, symmetry is most salient, stimuli with a vertical axis of symmetry should be preferred to stimuli of any other orientation.

4.1. Materials and methods

4.1.1. Subjects

The subjects were undergraduate students from Michigan State University: 20 men (18–24 years old) and 20 women (18–22 years old). These individuals comprised the low-asymmetry group in Experiment 2, and the abstract designs were administered subsequently immediately afterward.

4.1.2. Designs

The designs were digital images of geometric designs from several non-Western cultures (e.g., Aonikenk, Navajo, Yoruba). Using vector-based illustration software, Corel Draw 9, we produced a symmetrical and an asymmetrical version of the same design (totaling 800×570 pixels). Their positions in the display were counterbalanced across the experiment.

4.1.3. Experimental conditions

Three experimental conditions were defined as shown in Fig. 4: shape, designs with symmetrical shape compared to designs with asymmetrical shape; coloration, designs with symmetrical color compared to designs with asymmetrical color; orientation of symmetrical
design features, designs with vertical axis of symmetry compared to designs with nonvertical axis of symmetry (45° and 135°).

4.1.4. Procedure
Subjects were instructed to “choose the design that is more attractive in each pair of designs” for 10 pairs in each of the three conditions.

4.2. Results

Men’s and women’s preferences did not significantly differ across the three conditions \(F(1,38)=0.6, p=.81\) nor was there a significant interaction between sex and condition \(F(1,38)=0.5, p=.46\). Their scores, therefore, were combined for further statistical analyses. The results are summarized in Table 3.

Designs with symmetrical shape were judged to be more attractive than designs with asymmetrical shape \(t(39)=7.0, p<.001\). Symmetrically colored designs were judged to be more attractive than asymmetrically colored designs \(t(39)=8.3, p<.001\). Designs with a vertical axis of symmetry were chosen as more attractive than designs with a nonvertical axis of symmetry \(t(39)=6.1, p<.001\).

4.3. Discussion

The results confirm prior findings that stimuli with symmetrical shape are seen as more attractive (Eisenman & Gellens, 1968; Jacobsen & Höfel, 2001; Rentschler et al., 1999; Washburn & Humphrey, 2001). They also are consistent with the profuse use of symmetrical...
Design in the decorative arts across cultures (e.g., Washburn & Crowe, 1988). Designs with a vertical axis of symmetry were preferred over designs with a nonvertical axis of symmetry, which suggests that the preference for symmetry is compatible with the design of the visual...
system. Although color, unlike monochromatic stimuli, is not tuned to symmetry detection, color symmetry did significantly enhance attractiveness, which suggests that the known mechanisms of symmetry detection are not the only factors that affect visual preferences.

5. General discussion

The results of these three experiments show that symmetry enhances the attractiveness not only of faces per se and of faces decorated with symmetrical paint but of artistic–cultural products like those seen in the decorative arts. They also show that the effect of symmetrical face paint is weaker for female faces (although only in Experiment 2) and that symmetry enhances attractiveness even in stimuli that do not fit the apparent design of visual mechanisms for efficient symmetry detection.

At least three hypotheses have been proposed to account for the symmetry preference: the receiver bias hypothesis, the good-genes hypothesis, and the extended phenotype hypothesis. According to the receiver bias hypothesis, the preference is a byproduct of the properties of biological systems for recognizing objects in different positions and orientations (Enquist & Arak, 1994; Enquist & Johnstone, 1997; Johnstone, 1994). By this view, symmetry is perceptually salient because it represents the mean of a population of stimuli with random fluctuating asymmetries (Enquist & Johnstone, 1997; Jansson, Forknam, & Enquist, 2002). As such, symmetry does not signal fine-grained details such as the quality of a potential mate (Enquist, Ghirlanda, Lundqvist, & Wachtmeister, 2002).

Our findings in Experiments 1 and 2 show that although symmetrical decoration in faces enhances facial attractiveness, the effect depends on the sex of the face (stronger for same-sex faces in Experiment 1 and stronger for male faces in Experiment 2). The receiver-bias hypothesis would not predict sex differences, but it does predict our findings in Experiment 3, where subjects showed a preference for symmetrical over asymmetrical geometric designs, a preference that may be irrelevant for mate choice (but see the extended phenotype hypothesis below).

According to the good-genes hypothesis, the symmetry of morphological traits reliably signals an animal’s fitness for coping with environmental stressors. Thus, symmetrical faces are preferred in mate choice because they signal stable development and, therefore, fitness and mate quality (e.g., Møller & Thornhill, 1998; Thornhill & Gangestad, 1999). This hypothesis, however, does not address the question why symmetry is also preferred in decorative art. One possibility is that the adaptive value of detecting symmetry in potential mates generalizes to other objects (Little & Jones, 2003). If facial symmetry signals developmental stability and if symmetrical facial decoration does not or is a less reliable indicator of stability, the good-genes hypothesis also might account for the greater importance of facial morphology in judgments of female faces, namely, that female faces are less affected by decoration because, in general, their physical features are more important for assessing their quality as mates (or as competitors for mates). Clearly, further studies are needed to address the reliability and nature of the proposed interaction between a generalized preference for symmetry in abstract designs and a specific preference for morphological symmetry in faces.
According to the extended phenotype hypothesis, symmetrical art, instead of being mate-
irrelevant, signals the fitness of the artist on the premise that perfectly symmetrical designs
are hard to produce (Miller, 2000; Miller, 2001; Zahavi, 1978; Zahavi & Zahavi, 1997).
Because we did not ask any of the subjects, “Who is the best artist?” we could not directly test
this hypothesis. But if it is correct, then, for example, in Experiments 1 and 2, the perceived
skill with which the facial paint was applied cannot have been the only basis for the
perception of facial attractiveness. First, whether decorated or not, faces with symmetrical
features were perceived as more attractive than asymmetrical faces. Second, the effect of
symmetrical paint, rather than being constant across faces, depended on the sex of the face
and the sex of the subject (same- or opposite-sex faces).

In conclusion, our results show that adults prefer symmetrical faces and abstract designs and
that symmetrical decoration enhances facial attractiveness, that is, that the preference for
symmetry extends to the cultural products of facial paint and the decorative arts. This effect was
robust even when using different morphing techniques and comparing different populations.
This does not mean that all types of face painting or decorative art will tend to be symmetrical;
certain types, such as those used for mourning or warfare, probably do not have the
enhancement of physical attractiveness as their function. Our results do suggest, however, that
when that is the function or net effect, the designs will tend to be symmetrical. They also
suggest that although symmetrical art is very common, the preference for symmetrical facial
features is more likely to be constant than the preference for symmetrical art.

Our results provide indirect evidence for the influence of evolutionary biases toward
symmetry and for the effect of such biases on cultural practices. Further indirect support for
the hypothesis will require showing that, like the perception of attractiveness of other physical
traits (Marlowe & Wetsman, 2001; Yu & Shepard, 1998), the results are replicable across
cultures beyond the two reported here.

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209–222.


