

## Research Article

## WHAT IS AVERAGE AND WHAT IS NOT AVERAGE ABOUT ATTRACTIVE FACES?

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**Abstract**—We reported in this journal (Langlois & Roggman, 1990) findings showing that attractive faces are those that represent the mathematical average of faces in a population. These findings were intriguing because they provided a parsimonious definition of facial attractiveness and because they supported explanations of attractiveness from the point of view of both evolutionary and cognitive-prototype theory. Since our 1990 report, several alternative explanations of our findings have been offered. In this article, we show that none of these alternatives explains our results adequately.

We recently argued that faces representing the mathematical average of faces in a population are perceived as attractive (Langlois & Roggman, 1990). We demonstrated the effect of averaging faces on the perception of attractiveness by digitizing faces on a computer, mathematically averaging their matrices of image intensity values, and reproducing the facial images of the resulting averaged faces. Both male and female computer-generated facial images of 32 faces averaged together were judged as significantly more attractive than the sets of individual faces that yielded the averaged faces.

The notion that facial attractiveness can be defined by the mean of a population of faces has appeal because it provides a parsimonious answer to the age-old question, "What is (facial) beauty?" It also provides a parsimonious explanation for two puzzling facts. First, contrary to popular belief, even young infants prefer attractive to unattractive faces (Langlois, Ritter, Roggman, & Vaughn, 1991; Langlois et al., 1987; Langlois, Roggman, & Rieser-Danner, 1990; Samuels & Ewy, 1985). Second, cross-cultural judgments of attractiveness are more similar than different (Bernstein, Lin, & McClellan, 1982; Cunningham, 1986; Maret & Harling, 1985; McArthur & Berry, 1987; Thakerar & Iwawaki, 1979). Both of these findings defy the conventional wisdom that standards of facial attractiveness are learned gradually through exposure to the media and that standards of beauty vary widely from one culture to another. The attractiveness of averaged faces supports an explanation of both infant and cross-cultural preferences for attractiveness either in terms of evolutionary pressures that favor characteristics close to the mean of a population or in terms of cognitive processes that favor prototypical category members (see Langlois & Roggman, 1990, for a discussion).

Responses to our 1990 report have been numerous, ranging from comments in scientific journals (Alley, 1992; Alley & Cunningham, 1991; Benson & Perrett, 1992; Pittenger, 1991; Ridley, 1992) to reports in the popular press (ranging from reasonably accurate to absurd<sup>1</sup>). Some of these responses have revealed

significant misunderstandings of our position and methods. The purpose of this article is to clarify our position on facial attractiveness and to explore alternative explanations of our earlier findings in a series of new studies.

## WHAT WE MEAN BY "AVERAGE"

The word average has many definitions, including undistinguished, typical, common, and the arithmetic mean of a set of numbers; these different meanings have confused some readers (e.g., Alley & Cunningham, 1991). We use the term average only and strictly to denote the technical definition of the mathematical mean. Our averaged faces are not undistinguished, instead, they are quite good looking. Nor are they typical in the sense of common or frequently occurring in the population, although they may be typical in the sense that they are good examples of faces or are representative of the class of faces (Langlois & Roggman, 1990). What is average about them is their facial configuration. Averaging together a sample of whole faces produces a facial configuration that is close to the mean configuration of a population of faces. Much research has shown that an average is often perceived as a prototype (e.g., Bomba & Siqueland, 1983; Huttenlocher, Hedges, & Duncan, 1991; Posner & Keele, 1968; Rosch, 1978), and, like any prototype, the mean configuration of a set of faces should be perceived as a better example of a face and as more representative of the population of faces than are the individual faces in the set.

Although averaged faces are average in configuration, they are not average in attractiveness. The high attractiveness of averaged faces suggests that averageness is a characteristic of attractive faces. Thus, compared with unattractive faces, the faces of attractive individuals should be closer to the mean configuration of a population of faces and therefore more prototypical of, more representative of, and better examples of the class of faces, even though not typical, common, or frequently occurring.

Henceforth, to distinguish among the many meanings of the term average, we use it to denote the arithmetic mean, we use the word averaged to identify faces produced by our averaging procedure, the word averageness to describe a dimension with the high end nearest the mean of a population of faces and the low end furthest from the mean, and the word representative to denote the special meaning of "typical" as prototypical or exemplary of the category of faces.

## THE AVERAGE OF WHAT?

Misunderstandings about the steps involved in our averaging procedure have led to misinterpretations of what is averaged when averaged faces are created. In general, our technique of

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creating averaged faces involves scanning individual faces, converting each face to a set of numerical values representing the image, adding and dividing these sets of values to produce one set consisting of mean values, and regenerating a facial image from those values. The following detailed description is intended to clarify exactly what is averaged in the creation of averaged faces.

Initially, each face is scanned and digitized into a computer file. Any of these faces viewed on a computer screen or monitor appears like any video image of a face. These images are perceived as unified wholes or configurations even though they are actually composed of many rows and columns of small dots (pixels) that vary in intensity or shades of gray in our monochromatic images. As with any common video or newspaper image, these dots blend together perceptually to form an image of a face or any other object. By digitizing images of faces, each dot is converted into a numerical value, termed a *gray-value*, corresponding to the shade of gray at that location on the face. The resulting matrix of gray-values can be manipulated just as any other set of numbers can. In the first step of our averaging process, we digitized each face, thereby obtaining a  $512 \times 512$  numerical matrix of gray-values for each face. Figure 1 illustrates the digitizing process. In the second step, we mathematically averaged the matrices representing the different individual faces, weighting each face equally. Figure 2 illustrates the averaging process. An averaged face, then, is an image of a face in which each dot making up the image has the mean value of all the gray-values of the dots at the same relative location on all the faces whose values are used to create the averaged face. As can be seen in Figure 2 and elsewhere (Langlois & Roggman, 1990, Langlois, Roggman, Musselman, & Acton, 1991), a matrix of gray-values averaged across faces is perceived as a realistic face.

What we averaged together was the set of whole facial configurations. Because the locations of the individual features within faces vary, our method creates faces that are average in configuration and not necessarily in absolute size of features. A nose on one face may be placed slightly higher than a nose on another face, but because the noses are not the units of align-

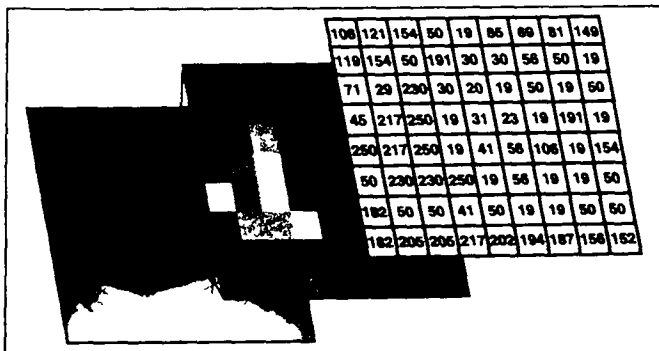


Fig 1 Digitizing faces. Black-and-white photographs of faces are composed of light and dark shades. Each shade has a corresponding numerical value, called a gray-value. Digitizing is the process of converting the light and dark shades in a photograph to the corresponding numerical gray-values. Higher numbers represent lighter shades, lower numbers represent darker shades.

ment or averaging, the average facial configuration does not necessarily have an average-size nose. Our data show that an averaged facial configuration is perceived as attractive, but show nothing about particular features or their sizes. We did not measure nor did we make any claims about the sizes of individual features because specific features are irrelevant to our method, to our theoretical approach, and to the perceptual processes that seem to be involved in the perception of faces. Extensive evidence that the perception of faces involves the visual processing of whole configurations (e.g., Goren, Sarty, & Wu, 1975; Hosie, Ellis, & Haig, 1988; Morton & Johnson, 1991; Purcell & Stewart, 1988; Rhodes, 1986; Sergent, 1984a, 1984b; Wells & Hryciw, 1984; Young, Hellawell, & Hay, 1987) suggests that a consideration of the absolute sizes of particular features is unlikely to be useful as an explanation of the attractiveness of whole faces (contrary to the position taken by Alley & Cunningham, 1991).

### ALTERNATIVE EXPLANATIONS

Our 1990 findings, demonstrating the perceived attractiveness of averaged faces, support our view that faces are preferred when they resemble a configuration close to the average configuration of faces in a population. Nevertheless, several alternative explanations of our results have been proposed. Each of these alternatives suggests that some characteristic other than averageness is present in both attractive and averaged faces, and that this other characteristic, rather than averageness, is responsible for our findings. These alternative explanations fall into two general categories: (a) that extreme or atypical conveyed characteristics of faces (e.g., youthfulness, symmetry, familiarity) are more critical than averageness in determining facial attractiveness and (b) that image-processing artifacts of our averaging procedure produced the results. We examined empirically the utility of each of these alternative explanations in explaining the perceived attractiveness of averaged faces.

#### Extremes or Averageness?

Alley (1992) and Alley and Cunningham (1991) have argued that because some animals prefer some extreme characteristics in conspecifics, atypical or extreme facial characteristics such as youthfulness and symmetry are preferred and better define attractiveness than does averageness. This claim is based on the non sequitur that if attractive faces are average in facial configuration, they also must be typical and average in other characteristics such as youthfulness (Alley, 1992). However, the mathematical average of the facial configuration of a population of faces is not logically equivalent to or definitionally isomorphic with any other perceived or actual characteristic. Faces that are average in facial configuration are indeed extreme in attractiveness and may, in fact, be extreme in other dimensions. Our use of the term average refers only to the gestalt of the face and not to conveyed impressions or any other characteristic.

#### Youthfulness

For another dimension, such as youthfulness, to qualify as an alternative explanation of our results, it must, at a minimum,

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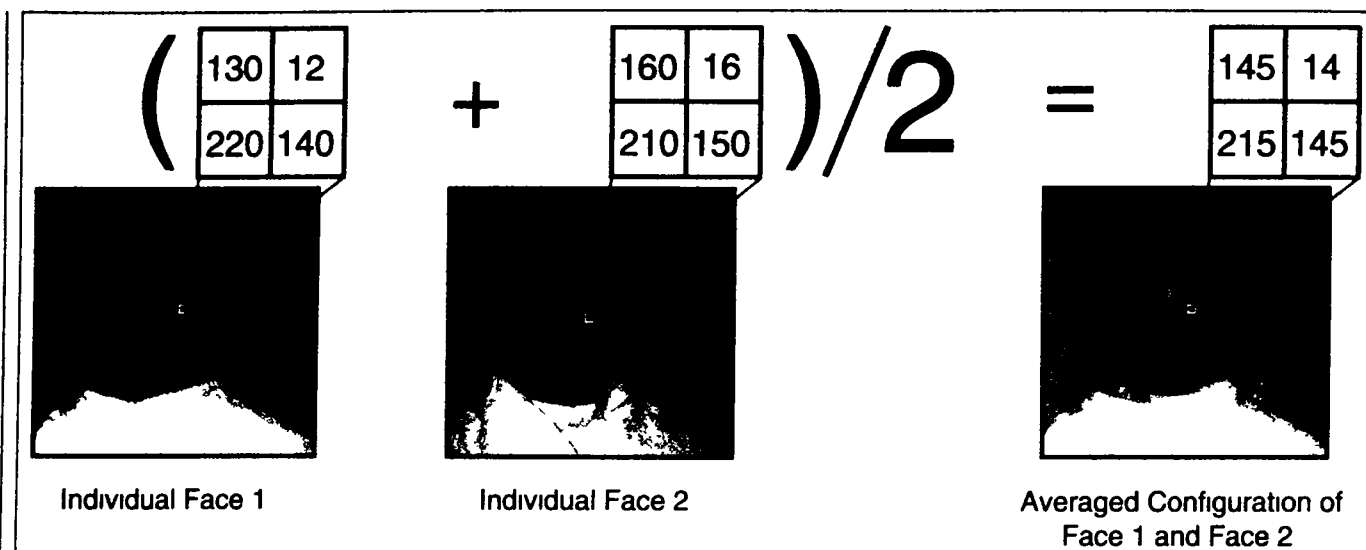


Fig 2 Averaging faces Gray-values from different faces are averaged together The result is an averaged face that is the mathematical average of the faces that yield it (Values are for illustrative purposes only)

be significantly and strongly related to attractiveness or at least be as strongly related to attractiveness as is averageness To test whether youthfulness meets this criterion, we asked raters to judge the age appearance of the individual faces used in constructing one of the male ( $n = 32$ ) and one of the female ( $n = 32$ ) averaged faces from our 1990 study and their corresponding male and female 32-face averaged faces Age was rated on a 9-point Likert scale corresponding to estimated ages ranging from 16 to 25 There were 58 judges for female faces ( $\alpha = .98, p < .001$ ) and 61 judges for male faces ( $\alpha = .98, p < .001$ ) The correlation between these ratings of youthfulness and the previous ratings of attractiveness (Langlois & Roggman, 1990) was  $r = .04, n.s.$ , for female faces and  $r = .13, n.s.$ , for male faces, indicating no overall relation between attractiveness and youthfulness in the sample

To replicate these findings, we used a second sample of 32 different female faces, which were rated for youthfulness by 34 judges ( $\alpha = .95$ ) and attractiveness by 41 judges ( $\alpha = .97$ ) Once again, no significant correlation between attractiveness and youthfulness was obtained ( $r = -.17, n.s.$ ) These data are consistent with those reported by Berry (1991), who similarly found no relation between ratings of attractiveness and facial babyfacedness in adults<sup>1</sup>

1 We are not arguing that age per se does not influence attractiveness ratings, much research shows that ratings of attractiveness decline with age, especially for women (e.g., Alley, 1988, Deutsch, Zalenski, & Clark, 1986, Henss, 1991, Mathes, Brennan, Haugen, & Rice, 1985, Milord, 1978) However, for youthfulness to account for our 1990 findings (as claimed by Alley & Cunningham, 1991), youthfulness must be correlated with attractiveness in our sample of young faces The low correlations between youthfulness and attractiveness that we obtained are not explained by restricted range in scores, even though our photographed subjects were all from a sample of young adults, because the variance in youthfulness ratings substantially exceeded the variance in both familiarity and attractiveness ratings, which were significantly correlated with each other (see the study on familiarity)

Nevertheless, because the averageness of averaged faces does not preclude the logical possibility of nonaverageness on other dimensions, we also examined youthfulness in male and female 32-face averaged faces compared with the individual faces that were averaged to create them Single-sample  $t$  tests (Howell, 1987) showed that the 32-face averaged faces were rated as significantly younger than the group of individuals for both male ( $M$  for individual faces = 19.7,  $M$  for averaged faces = 19.0,  $t[31] = 2.96, p < .01$ ) and female faces ( $M$  for individual faces = 19.5,  $M$  for averaged faces = 18.7,  $t[31] = 3.56, p < .01$ )

Thus, averaged faces can be both average in the sense of representing the mean of the faces in a population and, at the same time, extreme in characteristics such as youthfulness However, because there is not a relationship between youthfulness and attractiveness in samples of young adults that we and other investigators have studied, the perceived youthfulness of averaged faces cannot explain their attractiveness

### Symmetry

Several people have put forth the conventional-wisdom argument that attractive faces are extremely symmetrical and, therefore, that symmetry defines and explains attractiveness (Alley & Cunningham, 1991, Ridley, 1992) Alley and Cunningham (1991) claimed, for example, that our averaging technique artificially produces faces that are unusually symmetrical and that it is this extreme symmetry rather than the averageness of the faces that is responsible for the averaged faces' high attractiveness ratings Implied in this claim is the argument that the degree of symmetry is directly related to the degree of perceived attractiveness and, consequently, that perfectly symmetrical faces will be the most attractive in the population

As in the case of youthfulness, for symmetry to qualify as an alternative explanation of attractiveness, it is necessary (although not necessarily sufficient) for symmetry to be significantly and strongly related to attractiveness To test whether symmetry meets this criterion, we asked 22 raters to judge the

symmetry of 51 female faces. Thirty-two of these faces were the original faces used to construct one of the female averaged faces in our 1990 study. In addition, eight attractive faces, eight unattractive faces, one 32-face female averaged face, and two perfectly symmetrical, mirror-imaged female faces were selected to supplement the sample (see the next paragraph for a description of how mirror-image faces were constructed). The raters judged symmetry of the faces on a 5-point Likert scale ranging from "not very symmetrical" to "very symmetrical." The raters not only significantly agreed with each other about the symmetry of faces ( $\alpha = .90, p < .001$ ), but also rated the mirror-image faces as significantly more symmetrical than the other faces ( $M$  for symmetrical faces = 4.86,  $M$  for individual faces = 3.13,  $t(47) = -18.02, p < .001$ ), thereby validating this measure. However, attractiveness judgments from 59 judges ( $\alpha = .98, p < .001$ ) were not significantly correlated with the symmetry ratings ( $r = .11$ ), indicating little relation between attractiveness and ratings of symmetry.

Although variations in perceived symmetry were not related to variations in attractiveness across the range of normal faces in this sample, the claim that the symmetry of averaged faces explains their attractiveness is based on the assumption that perfectly symmetrical faces would also be exceptionally attractive (Alley & Cunningham, 1991). To test the relationship of perfect symmetry to attractiveness, we produced perfectly symmetrical faces using the faces from the first symmetry study. We divided each face down the center and then formed two perfectly symmetrical faces from the halves: a "left" face in which the mirror image of the left side of the face was appended to the left side of the face and a "right" face in which the mirror image of the right side of the face was appended to the right side of the face. Attractiveness ratings were then obtained for the left faces (74 judges,  $\alpha = .98, p < .001$ ) and the right faces (55 judges,  $\alpha = .97, p < .001$ ). The attractiveness ratings for both the left and the right symmetrical faces were compared with the ratings from the first symmetry study for the original, unaltered faces. The analyses of these ratings revealed that the original faces ( $M = 2.42$ ) were perceived as more attractive than either the perfectly symmetrical left faces ( $M = 1.98$ , paired  $t(47) = 8.27, p < .001$ ) or the perfectly symmetrical right faces ( $M = 2.10$ , paired  $t(47) = 5.6, p < .001$ ). A repetition of these analyses with only the 32 faces used to construct the original averaged face (all of which had been randomly selected from a much larger population of faces) provided the same results.

Although the data show that attractiveness is not simply equivalent to high or extreme values of symmetry, it would be counterintuitive to assume that symmetry has no effect on the perception of attractiveness in faces. Perfect symmetry does not improve the attractiveness of most normal faces, but some faces did, indeed, receive higher attractiveness ratings in their symmetrical than in their original versions. Comparisons of the original attractiveness ratings indicated that faces that were "improved" by symmetry were significantly less attractive originally than those that were not improved (for left faces,  $M$  for improved = 1.73,  $M$  for not improved = 2.52,  $t(46) = -2.7, p < .01$ , for right faces,  $M$  for improved = 1.82,  $M$  for not improved = 2.58,  $t(46) = -3.2, p < .002$ ).

We conclude from these data that although some degree of

symmetry is important to attractiveness, symmetry does not determine perceived attractiveness in a range of normal faces with no craniofacial deformities. (It is obviously difficult to imagine an extremely asymmetrical face, such as a face with one eye much higher than the other, that would appear normal, much less attractive.) Only faces that are exceptionally unattractive are likely to be improved by perfect symmetry, and, indeed, perfectly symmetrical faces are not necessarily attractive at all. Our data are consistent with the oft-heard wish of attractive movie stars to be viewed from their "better" sides and with anthropometric studies of the face and head. Normal faces, including attractive ones, have some degree of asymmetry (Previc, 1991; Sackheim, 1985; Vig & Hewitt, 1975). Symmetry by itself is not sufficient to account for perceived attractiveness and, therefore, does not explain the attractiveness of averaged faces.

### Familiarity

Another alternative explanation that has been offered for our results claims that averaged faces are more attractive because they are perceived as unusually familiar (Alley & Cunningham, 1991). This hypothesis is not actually an alternative at all, however, because it is part of our explanation of our results and an integral part of our theoretical position (see Langlois & Roggman, 1990). We proposed that one reason that both averaged and attractive faces are preferred is because they are perceived as prototypes of "faceness" and hence may be perceived as familiar even though they have never been seen before. There is a significant body of research from cognitive and developmental psychology showing that after seeing several exemplars from a category, both infants and adults respond to an averaged representation of those exemplars as if it were familiar even though they have never before seen it (Bomba & Siqueland, 1983; Posner & Keele, 1968; Rosch, 1978; Strauss, 1979). Thus, the averageness of averaged faces makes them representative of a population of faces, easily and readily processed and familiar to humans as human faces, according to our point of view. Accordingly, familiarity and attractiveness *should* be related.<sup>2</sup>

To test this hypothesis, we had raters judge the familiarity of

2 We have been asked if it is not contradictory to propose that averaged or prototypical faces should seem familiar and yet that infants should look longer at attractive faces (e.g., Langlois, Ritter, Roggman, & Vaughn, 1991). This question arises from the assumption that infants prefer novelty and should, therefore, look less, not more, at familiar, attractive faces. However, underlying this view is the erroneous assumption that infants (and older humans) always prefer novelty. This is obviously not true. Infants are very familiar with their mothers but usually prefer them to novel strangers. Whether individuals will prefer novelty or familiarity will depend on many factors, and predictions for novelty and familiarity preferences are not necessarily incompatible. For example, if habituated to an attractive face, infants subsequently should prefer a novel, less attractive face to the attractive one with which they have become bored. In the absence of habituation, however, infants should look longer at attractive than at unattractive faces. There is nothing incompatible about these predictions given the differences in methodology and in the infants' experience and state (Hunter & Ames, 1988; Kagan, 1967; Nachman, Stern, & Best, 1986).

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the individual faces and the 32-face averaged faces from one of the male and one of the female samples from our 1990 study. Familiarity was rated on a 5-point Likert scale with "very unfamiliar" and "very familiar" as endpoints (alpha for male faces = .81 with 58 raters, alpha for female faces = .85 with 61 raters). First, we conducted single-sample *t* tests and compared the familiarity ratings of the individual faces as a group with the familiarity ratings of the 32-face averaged faces. The averaged faces were judged to be significantly more familiar than the individual faces (for male faces,  $M$  for individual faces = 1.89,  $M$  for 32-face averaged face = 2.22,  $t(31) = -7.17$ ,  $p < .001$ , for female faces,  $M$  for individual faces = 1.87,  $M$  for 32-face averaged face = 2.15,  $t(31) = -4.60$ ,  $p < .01$ ). Paired, within-subjects *t* tests showed that no individual males were rated as significantly more familiar than the male averaged face, and only one individual female was rated as significantly more familiar than the female averaged face, less than would be expected by chance for the 64 tests conducted. Finally, for the 32 male and 32 female individual faces, we computed correlations between the familiarity ratings from this panel of judges and the attractiveness ratings from the panel in our earlier study. The correlation between familiarity and attractiveness was  $r = .73$ ,  $p < .001$ , for male faces and  $r = .77$ ,  $p < .001$ , for female faces.

Therefore, the relation between perceived attractiveness and perceived familiarity in randomly selected samples of male and female individual faces is strong and positive, as it should be according to our earlier explanations (Langlois & Roggman, 1990). Furthermore, averaged faces are perceived as more familiar than individual faces. This finding is particularly striking because the averaged faces, of course, do not exist in real life and could never have been seen previously by the raters.

### Alleged Image-Processing Artifacts

#### *Blemishes, smoothing, blur, distorting, and resolution*

Questions about our technique have suggested that some artifactual effect of the averaging procedure, rather than averageness, explains the attractiveness of the averaged faces. Poor resolution, stretching and distortion of the faces, blur, smoothing, and resulting removal of blemishes have all been invoked as causing the perceived attractiveness of the averaged faces (Alley & Cunningham, 1991, Benson & Perrett, 1992, Pittenger, 1991). The image-processing techniques we used to produce averaged faces yielded matrices of 262,144 image values with a range of 256 gradations of gray, more than 1,000 times greater than the resolution required for face recognition (Harmon, 1973). Accordingly, poor resolution cannot be an adequate account of our results. As described in our 1990 report, the techniques we used did not involve any distortion of facial images by stretching the faces, and the individual faces were smoothed and blurred to make the averaged and individual images visually similar in degree of blur. Therefore, differences in the attractiveness of averaged and individual photographs cannot be attributed to stretching, distortion, smoothing, blurring, or the presence or absence of blemishes (see Langlois, Roggman, Musselman, & Acton, 1991, for further discussion of some of these points).

### *The effects of the averaging process*

Some critics have suggested that the attractiveness of our averaged faces may be simply an artifact of the process of combining multiple images (Alley & Cunningham, 1991). According to this view, the difference in attractiveness between the averaged faces and the individual faces in our 1990 study could be attributed to the visual effects of combining multiple images (e.g., increased blur and symmetry) rather than to the configurational effects of combining many faces. Although we have discussed already how some of these proposed artifacts (blur and symmetry) cannot explain our results, we have not directly tested the hypothesis that some other artifact of the averaging process is responsible for the attractiveness of averaged faces. To test whether it is the averaging of different faces or merely the combining of different images that creates attractiveness, it is necessary to compare an averaged face with individual faces created in the same manner (Alley & Cunningham, 1991). Such a comparison, in which both individual and averaged faces are created using the identical procedure and number of images, ensures that the only difference between the averaged face and the individual faces is the number of different faces used to create them.

To test the possibility that some aspect of combining multiple images could account for the attractiveness of averaged faces, we compared the attractiveness of an averaged face made from images of multiple faces with the attractiveness of faces that were each created by combining multiple images of the same face. To create this set of multimage individual faces, for each of 32 individuals, we took 16 different photographs from slightly different distances and angles. To simulate the symmetry Alley and Cunningham assumed to be present in averaged faces as an artifact of the averaging process, we combined those 16 images in alternating original and mirror-reversed forms, creating a symmetrical 32-image version of each individual face. To create the 32-face averaged face from those 32 individuals, we randomly selected a single photograph of each of the 32 individuals and averaged those images. Thus, the photographs for the individual and averaged faces were produced in exactly the same manner in all aspects except in the number of different faces used to create them.

If the greater attractiveness of averaged faces is either a product of combining multiple images or an artifact of this procedure, then any faces created by combining the same number of images, regardless of whether by combining photographs of many people or many photographs of the same person, should be equivalent in attractiveness. Hence, the 32-face averaged face should be no more attractive than the 32-image individual faces if critics of our procedure are correct. However, this was not the case. Even when all images were created from the same number of photographs using identical image-processing techniques, the 32-face averaged face ( $M = 3.46$ ) was significantly more attractive than the set of 32-image individual faces ( $M = 2.30$ ,  $t(31) = -10.34$ ,  $p < .001$ ), precisely replicating our earlier results (Langlois & Roggman, 1990). In addition, only one of the 32-image individual faces was significantly more attractive than the 32-face averaged face, less than would be expected by chance for the number of tests conducted, also replicating our 1990 results.

Because the image-processing techniques used to create

both types of faces were identical and combined the same number of images, image-processing artifacts cannot explain the greater attractiveness of averaged faces compared with individual faces. The only distinction between the individual and averaged faces was the number of different faces used to create them, not the number of images or the processes used to create them. Averaging multiple faces rather than averaging multiple images is what makes an averaged face attractive.

### FUNDAMENTAL BUT NOT EXCLUSIVE

Finally, we emphasize again that we do not claim that averageness is the single element influencing attractiveness. Obviously, other characteristics, such as age and pleasantness of expression, vary within and across individuals, and these variations can influence attractiveness ratings (Alley, 1988, Deutsch, Zelenski, & Clark, 1986, Henss, 1991, Hildebrandt, 1983, Mathes, Brennan, Haugen, & Rice, 1985, Milord, 1978, Mueser, Grau, Sussman, & Rosen, 1984). However, because a face can be both young and smiling and still be quite unattractive relative to other young, smiling faces, we believe that averageness is a necessary, fundamental component of attractiveness, whereas characteristics such as pleasant expression are not.

We welcome constructive suggestions of alternative hypotheses that may explain our finding that faces close to the average of faces in a population are attractive. Thus far, none of the proposed alternatives explains satisfactorily the attractiveness of averaged faces. Smoothing, blur, image resolution, and other image-processing techniques cannot account for our findings, nor can symmetry or conveyed youthfulness. However, as we predicted, familiarity is significantly related to both averageness and attractiveness, further supporting the view that attractive faces are preferred because they are close to the population average.

We remain convinced that a face is perceived as attractive not because it is exceptionally youthful or unusually symmetrical, or because the photograph of it has been blurred, smoothed, contrast enhanced, or processed on a computer. Rather, a face is perceived as attractive when its facial gestalt is close to the average or mean of a population of faces.

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