Perceptual and Motor Skills, 1997, 85, 363-374. © Perceptual and Motor Skills 1997

WHY BARBIE IS PERCEIVED AS BEAUTIFUL[1]

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Summary.—The long-term acceptance and success of the Barbie doll suggests the physical characteristics of the doll are perceived as attractive. When viewed in the context of universal attractiveness, response to the doll raises the question of why Barbie is perceived as attractive. Published paleontological data on hominid fossils indicate how the shapes and anatomical proportions of humans have evolved. Included in the fossils are phenotypic traits no longer prevalent in humans (primitive) and phenotypic traits that have become increasingly prevalent (derived). It is noted that the anatomical proportions of the Barbie doll are exaggerated and emphasize derived characteristics. It was proposed that in the perception of human form, derived traits are perceived as attractive while primitive traits are perceived as unattractive. Drawings and photographs were utilized to survey reactions to a comparison of primitive vs derived traits by 495 subjects, instructed to select the shape or proportion they considered more attractive. There was significant agreement among the subjects that derived anatomical traits were perceived as more attractive than primitive ones. The Barbie doll is illustrative of how human beauty has evolved and indicates elements of human form that appear beautiful. The doll emphasizes our derived evolutionary traits and, possibly, that is why the doll is perceived as attractive.

The Barbie doll was first marketed in 1959 (Boy, 1987; Lord, 1994). The doll was created by Ruth Handler who, with her husband Elliot, founded the Mattel Toy Company. In 1993, the Barbie division of the company exceeded the $1 billion mark in annual sales (Lubove, 1994). The success of the Barbie doll, as a marketable product, is in part a phenomenon of human perception. Marketing strategies aside, the long-term acceptance and success of the doll could be due to its physical appearance and being perceived as attractive by a large number of children and adults. This raises the question of whether the physical proportions and traits of the Barbie doll are universally attractive.

Aestheticians have espoused the belief that the pleasure experienced in perceiving beauty is due to an inner sense (Hutcheson, 1725/1971). It has long been argued that an individual's delightful reaction to countenance and proportions of human form is innate and has aspects of universality (Kant, 1790/1951). More recent survey data have shown that there can be agreement among people of different cultures, ages, social status, and sex as to what is perceived as physically attractive (Cunningham, 1986; Burns & Fa-

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rina, 1992). However, a question which has not been fully answered is what is the origin of this agreement or universality in our perceptions of attractiveness? It has been proposed that averageness is the essence of human beauty (Symons, 1979). This proposal rests on the fact that "average" faces created by composite photographs (Galton, 1878) or by computer-generated digital composites (Langlois & Roggman, 1990) are perceived as attractive. On the other hand, it has been argued that although an average face (which is a composite of many faces) is attractive, optimally attractive faces are not necessarily average (Alley & Cunningham, 1991). Contrary to the hypothesis of averageness, digital composite faces which consist of exaggerated differences from the average have been used to show that atypical characteristics can enhance facial attractiveness. For example, the face shape judged most attractive had larger eyes, higher cheek bones, and a shorter distance between the nose and mouth than the so-called average face (Perrett, May, & Yoshikawa, 1994).

A resolution of the averageness vs atypicality debate has implications for furthering understanding regarding the innateness, universality, and functional significance of our sense of beauty of human form. The physical proportions and characteristics of the Barbie doll are not average but rather are exaggerated from the norm (Penderson & Markee, 1991).

A resource that has been overlooked in understanding our sense of beauty of human form is the published paleontological fossil record of how humans have evolved. The fossil record illustrates traits no longer phenotypically prevalent in humans (primitive) and phenotypic traits that have become increasingly prevalent (derived). The realization that the proportions of the Barbie doll are exaggerated and derived has helped to stimulate the idea that our perceptions of beauty of human form may be based on how the shapes and proportions of humans have evolved. In this paper, reference is made to published paleontological information about the anatomical evolution of humans to create drawings that can survey the comparative attractiveness of primitive and derived traits.

Method

Drawings and Photographs

The drawings and photographs used in this paper were developed to survey reactions to a comparison of primitive vs derived anatomical traits. The most dramatic anatomical changes that have evolved (derived traits) over the last 3 to 4 million years are primarily related to an increased dependence on visual acuity, bipedal locomotion, development of an omnivorous diet, enhanced manual dexterity, reduced sexual dimorphism, and a greater reliance on intelligence (Lovejoy, 1974; Johanson & Edey, 1981; Stern & Susman, 1983; Tattersall, 1986; Trinkaus, 1986; Simons, 1989).

Some of the anatomical changes associated with the development of bipedalism are longer legs, thigh bones that angle toward the knee from the socket of the pelvis (slightly knock-kneed rather than bow-legged), overstepping toward the stationary foot while walking, an appearance of plantar flexion while walking and shifting weight to the ball of the foot (toe lower than the heel), less curvature of the toes, and over-all increase in height and more muscled and pronounced calves and buttocks. Becoming less arboreal also resulted in anatomical changes which include a thorax that is less cone-shaped, less sloping shoulders, a longer neck, and less curvature of the fingers. Anatomical changes associated with becoming more omnivorous included a smaller and narrower upper and lower jaw, a defined chin, teeth becoming closer together and a loss of the spaces between the canines and lateral incisors, reduced width of the molars, incisors and canines that are more spatulate, less rounded abdomen and a slimmer waistline (v-shaped torso), smaller chewing muscles, loss of a cranial sagittal crest, a more triangular or oval-shaped face, a shorter distance between the nose and the lips, and a mouth that does not jut out beyond the nose (orthognathic rather than prognathic). Changes in the hand include a longer thumb, shorter palm, and straighter fingers. A greater dependence on vision has resulted in large, deep-set eyes. Changes associated with decreased differences between the sexes include less difference in muscularity, less pronounced brow ridge on males, less difference in body size, and the development of similar teeth, particularly less difference in the size of the canines. Changes relative to an increased dependence on intelligence are increased cranial capacity, higher and less sloping forehead, and more vaulted bones of the temple area resulting in a higher and more domed shaped cranium.

Subjects

For this report, survey data were accumulated by having 495 individuals evaluate more than 50 figures. Each figure was a composite of two pictures that were either photographs or drawings. The two pictures differed slightly in a single anatomical trait but were similar in all other aspects. For the figures that depicted humans, an attempt was made to present each sex with similar frequency. The two pictures compared were projected side-by-side on a large viewing screen. One picture was labeled A and the other B. One of the pictures represented an anatomical shape or proportion that was more derived and the other one that was more primitive. No information was given to the individuals being surveyed except they were instructed to select the shape or proportion they considered more attractive. The derived trait was projected with equal frequency as either Picture A or Picture B and the individuals being surveyed scored their preference on a Scantron sheet. The individuals being surveyed were informed that the objective was to select the

picture that was more attractive and that it was not necessary to consider the selected picture absolutely attractive. The figures being evaluated did not portray aspects of health, age, race, or culture. Therefore, the survey did not address the participants' reactions to these aspects. The surveyed individuals provided information on the Scantron sheet about their own age, race, sex, and cultural origin. The 495 individuals were surveyed in Westville and West Lafayette, Indiana. The population of evaluators consisted of 67% female, 33% male, and 92% Euro-American. They ranged in age from 18 to 45 years.

Statistical Treatment of Data

The individuals surveyed were taken as a population ($N=495$) which produced a test statistic for each of the drawings. A proportion for each test was obtained by totalling the number of individuals who perceived the derived trait as more attractive and dividing by the total number of individuals in the population. When computing the proportion, the total number of evaluators ranged from 491 to 495, thus indicating that some individuals did not respond to every comparison. The statistical method determined whether there was a significant difference between the sample proportion and the proportion (0.50) of a theoretically normally distributed population which perceives no difference between a derived and primitive trait. Statistical significance was assessed by testing the null hypothesis which states that the sample's proportion for each specific trait evaluated is not significantly different from the theoretical population's proportion of 0.50. If a test statistic produced a significant rejection of the null hypothesis ($p<.05$), it was then concluded that the tested population perceived a difference between the particular primitive and derived anatomical trait tested. If the sample proportion for selecting the derived trait exceeded a value of 0.50 at a significance level sufficient to reject the null hypothesis, then it was concluded that the tested population perceived the derived trait as more attractive than the primitive trait.

Results

Shown here are nine examples from the drawings and photographs used in accumulating the survey data for this report. Within each figure are two pictures which present primitive and derived traits. The nine figures shown here are a fair representation of the 50 figures utilized in the study. For the evaluation of each figure, no information was given to the evaluator except what comparison was to be made and to select the one that the evaluator perceived as more attractive.

The statistical data for the nine figures are tabulated in Table 1. Included in the data are the number of subjects surveyed (sample), the sample's proportions, and the p value for the rejection of the null hypothesis,

TABLE 1
SURVEY DATA OF ANATOMICAL COMPARISONS SHOWN IN FIGURES 1 TO 10

Comparison	Figure	Sample Proportion	p*
Long vs Short Legs	1	Long (458/493 = 0.93)	< .0005
Long vs Short Neck	2	Long (389/493 = 0.79)	< .0005
Plantar vs Dorsal Foot Flexion	3	Plantar (464/493 = 0.94)	< .0005
Square vs Sloping Shoulders	4	Square (391/491 = 0.80)	< .0005
Angled-in vs Angled-out Teeth	5	Angled-in (299/492 = 0.61)	< .0005
Long vs Short Shin	6	Long (425/492 = 0.86)	< .0005
Strong vs Weak Chin	7	Strong (455/493 = 0.92)	< .0005
Large vs Small Eyes	8	Large (381/493 = 0.79)	< .0005
Knock-kneed vs Bow-legged	9	Knock-kneed (354/492 = 0.72)	< .0005

*Significance levels for rejecting the null hypothesis which assumes a population proportion of 0.50. p values < .00001 are listed as $p < .0005$.

i.e., that a theoretical population would perceive no difference between the two pictures of a figure.

Fig. 1 is a pair of drawings which compare longer vs shorter legs. The longer legs are a derived trait. The evaluators were instructed to notice the ratio of the legs to the torso and select the ratio they perceived as more at-

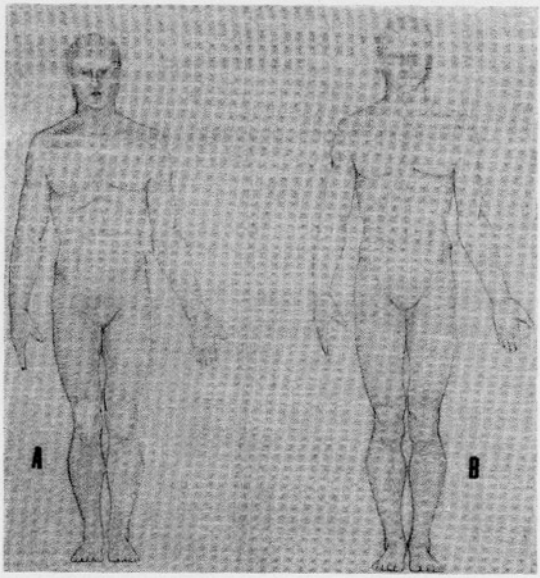

FIG. 1. In comparing the ratio of the leg to the torso, which is more attracitve, drawing A or B?

tractive. The data indicate that the sample rejected the null hypothesis ($p <$ .0005) and considered the longer legs more attractive. Fig. 2 shows a pair of drawings which compare a short and long neck. The fossil record shows that

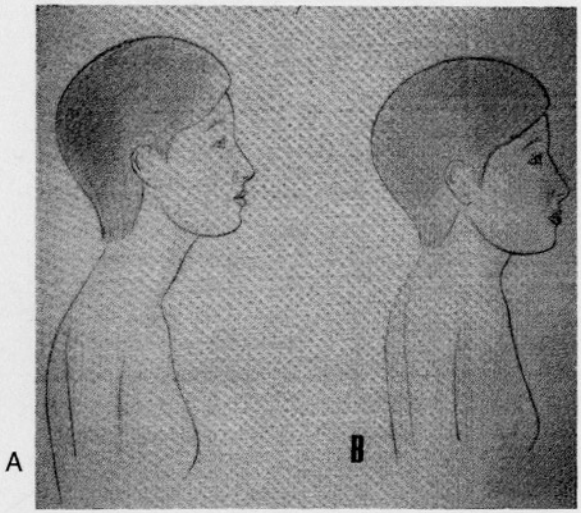

FIG. 2. In comparing the neck, which is more attractive, drawing A or B?

our necks have become longer, making a short neck a primitive trait and a longer neck a derived trait. The data indicate that the longer neck was perceived as more attractive. Fig. 3 consists of a pair of photographs that compare dorsal and plantar foot flexion. Plantar foot flexion is a derived trait and was perceived as more attractive. In comparing shoulders, the square

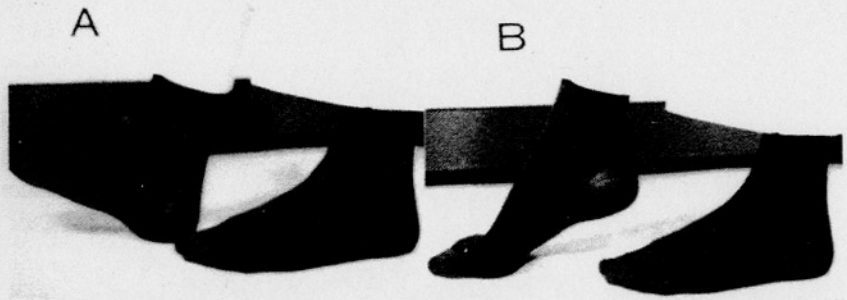

FIG. 3. In comparing the position of the feet, which is more attractive, photograph A or B?

shoulders were considered more attractive than sloping shoulders (Fig. 4). The drawings in Fig. 5 compare teeth that angle out vs teeth that angle in. Prognathism is a primitive trait, while orthognathism is derived. The teeth that slope in and emphasize orthognathism were considered more attractive. In comparing the ratio of length of the shin to the length of the thigh (Fig. 6), the longer shin was perceived as more attractive. In comparing the draw-

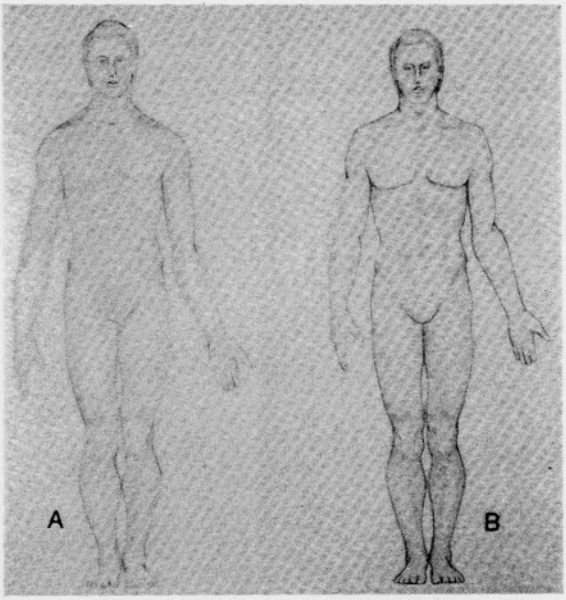

FIG. 4. In comparing the shoulders, which is more attractive, drawing A or B?

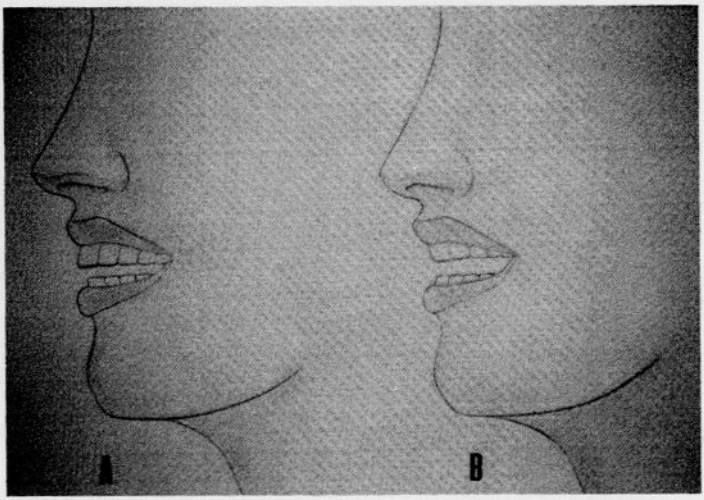

FIG. 5. In comparing the teeth, which is more attractive, drawing A or B?

ings of chins in Fig. 7, the more defined or stronger chin is a derived trait and was considered more attractive. The larger eyes in Fig. 8 were perceived as more attractive. When comparing slightly knock-kneed to bow-legged (Fig. 9), the evaluators selected the knock-kneed drawing as more attractive.

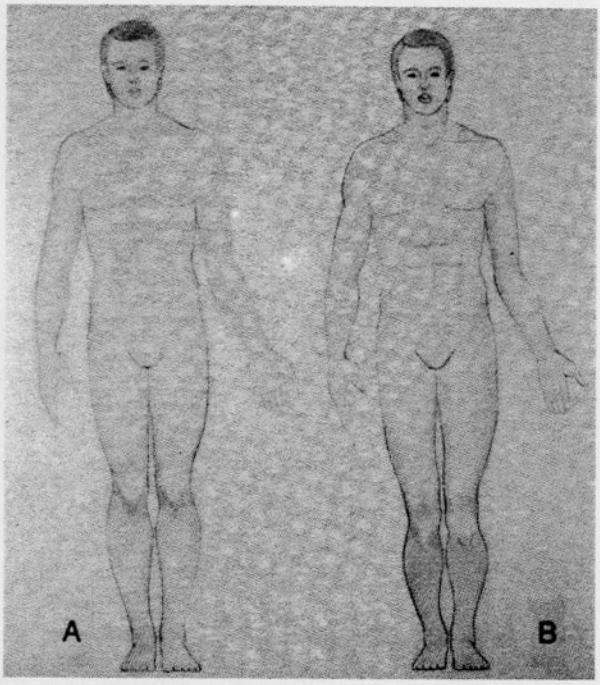

FIG. 6. In comparing the ratio of the shin to the thigh, which is more attractive, drawing A or B?

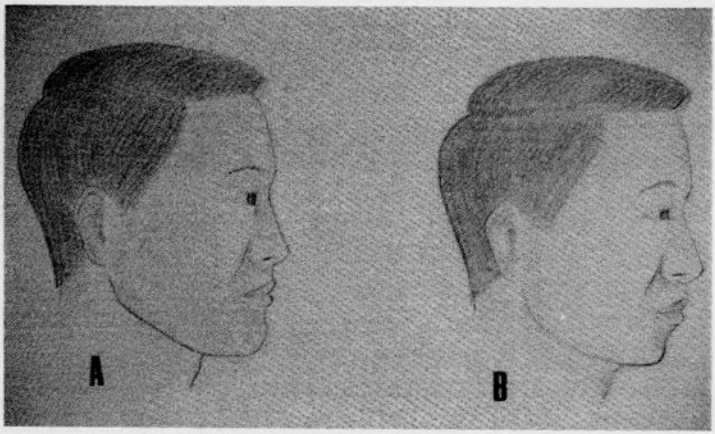

FIG. 7. In comparing the chin, which is more attractive, drawing A or B?

Other figures utilized in the survey are not shown here. For the purpose of verifying consistency, there was redundancy included in the survey and some of the primitive vs derived traits were presented in different for-

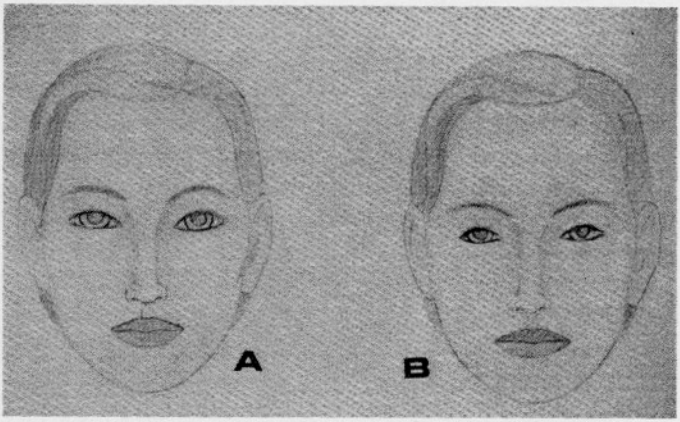

FIG. 8. In comparing the eyes, which is more attractive, drawing A or B?

mats. The data were consistent in showing that derived traits are perceived as more attractive than primitive traits. Fig. 10 illustrates some of the derived characteristics that are emphasized in the Barbie doll.

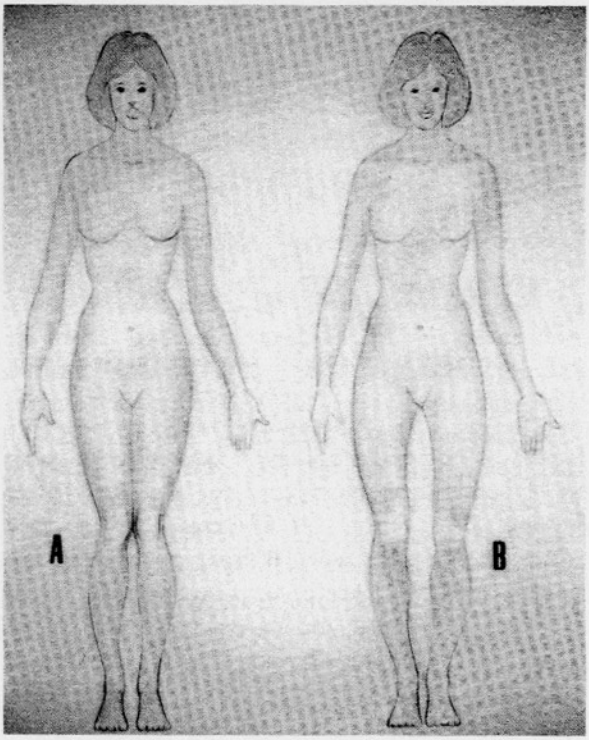

FIG. 9. In comparing the legs, which is more attractive, drawing A or B?

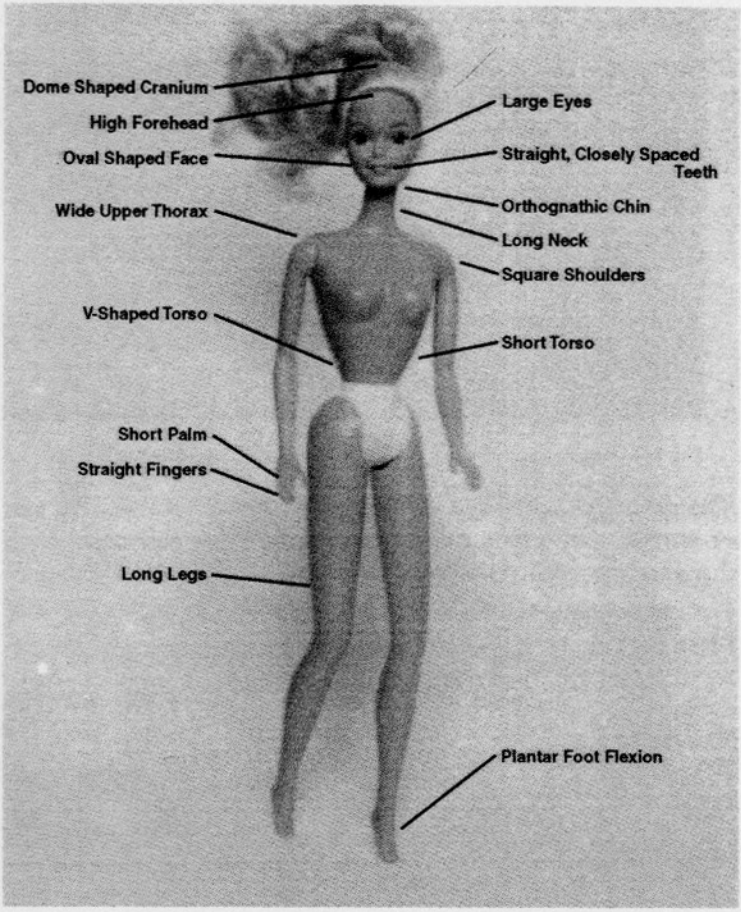

FIG. 10. An example of the Barbie doll showing its derived traits

DISCUSSION

Interpretations of hominid fossils have been directed primarily toward the elucidation of hominid taxonomy and the phylogeny of *Homo sapiens* (Thorne & Wolpoff, 1981; Stringer & Andrews, 1988). However, included in the fossils are traits no longer phenotypically prevalent in humans (primitive) and phenotypic traits that have become increasingly prevalent (derived). The dental, gnathic, facial, cranial, and skeletal fossils are records of how the shapes and proportions of hominids have evolved (Dart, 1925; Broom, 1938; LeGros Clark, 1950; Robinson, 1956; Brown, *et al.*, 1958; Johanson, White, & Coppens, 1978; Wood, 1991). The genus *Homo* first appeared on the African continent some 2 to 3 million years ago (Leakey, Tobias, & Napier,

1964). Modern humans are the only surviving hominid, but fossils indicate that throughout its evolution the genus *Homo* coexisted with other bipedal hominids and closely related quadrupedal pongids that possessed more primitive phenotypic traits. Here we have used paleontological information about the anatomical evolution of humans to create drawings and photographs that can survey the comparative attractiveness of primitive and derived traits.

There was significant agreement among the members of the sample surveyed that derived anatomical traits are perceived as more attractive than primitive traits. Although modern humans are the only surviving hominid, surviving primates of the family Pongidae are fairly closely related to us. The living apes possess primitive anatomical traits. Primitive traits that surviving pongids possess include dorsi foot flexion, short shins, short and bowed legs, a short and rounded chin, pointed and large canines, a diastema between the lateral incisors and the canines, gums showing above the teeth, short thumbs, long palms, curved fingers, a longer distance between the nose and lips, prognathism, and a short neck.

It is conceivable that preferences for derived characteristics would exert a directional pressure in selection that enhances phenotypic expression of derived traits. Also, an aversion to primitive anatomical traits could constitute a pressure in selection for maintaining separateness of species and thereby avoiding cross-species mating, which poses the risk of producing sterile offspring or offspring that are primitive phenotypes.

The Barbie doll is illustrative of how perceived human beauty has evolved and demonstrates elements of our nature that are perceived as beautiful. Examining the physical traits of the Barbie doll, it appears tall, long-legged, slim-waisted, has long neck, curved red lips, large eyes, square shoulders, short torso, straight teeth with no points or spaces, smooth and hairless skin, plantar foot flexion, long, straight fingers, nonsloping forehead, flat abdomen, and is not bow-legged. Companies other than Mattel have challenged the fashion doll market with dolls that have less exaggerated body proportions (Warner, 1991). The Happy to Be Me doll, designed and marketed by Cathy Meredig, has a thicker waist, shorter neck, and shorter legs than the Barbie doll, with feet that are flat rather than permanently slanted. Although marketed as a healthy alternative to the Barbie doll, the Happy to Be Me doll has had little effect on the sales of fashion dolls (Miller, 1991). The Barbie doll shows us what we wish to be. It emphasizes our derived evolutionary physical traits and possibly that is why the physical characteristics of the doll are perceived as attractive.

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Accepted May 23, 1997.