The Evolution of Body Size

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The size of organisms on earth ranges over greater than 30 orders of magnitude, despite the fact that all life forms have evolved from unicellular forms. Changes in size and shape may confer advantages, both in terms of survival and in reproductive success, but may also reflect the impact of health and nutrition.

Although *H. sapiens* may share 98% DNA identity with chimpanzees and 92% identity with Old World monkeys, evolution has endowed our species with unique growth patterns. The entire human growth velocity curve is, in actuality, extraordinarily complex, so unusually complicated (even relative to other primates) that it cannot be expressed by a 6th degree polynomial equation. Unique features of human velocity curves include: 1) the attainment of maximal growth velocity during late gestation (rather than in early infancy, as in most species); 2) deceleration of growth velocity after birth; 3) relatively late sexual maturation; 4) the onset of puberty at the time of slowest growth in childhood; 5) the presence of a marked adolescent growth spurt in height; and 6) the relatively prolonged delay between puberty and the attainment of full reproductive capacity (especially in females).

Another auxological characteristic of *H. sapiens* that is often overlooked is the relative lack of sexual dimorphism in stature. The mean difference in stature between adult males and females is only 12.6 cm (5 inches), reflecting only 7% of adult stature. Prepubertally, males and females grow at virtually identical rates, with the mean differences in height between boys and girls averaging approximately one cm. Essentially any and all sexual dimorphism in stature can be explained by differential growth during puberty, particularly in the timing of epiphyseal fusion under the influence of estrogen exposure. Largo et al have accounted for the 12.6 cm difference in adult stature between males and females on the following basis: 1) greater male growth during adolescence (+1.6 cm); 2) delayed onset of adolescence in males, with late completion of puberty (+6.4 cm); 3) greater intensity of male growth spurt (+6.0 cm); and 4) longer duration of growth after the pubertal growth spurt in females (-1.4 cm).

The existence of these unique axiological features unquestionably reflects evolutionary advantages to H. sapiens as a species, either from the perspective of survival or reproductive success, because all such characteristics come with a distinct "price" to the individual and to the species. The late onset of puberty, for example, leaves human children and adolescents physically vulnerable for a prolonged period of time and delays their ability to be reproductively successful. Such disadvantages must be offset by tangible benefits from the perspective of survival of the species (see below). It would thus seem appropriate to ask the following questions: What are the evolutionary bases and the competitive advantages to *H. sapiens* of: 1) the adolescent growth spurt and 2) the relative lack of sexual dimorphism in stature?

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