

The future mismatch between biological and social development of youths

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Abstract

Biological development of children and youths is undergoing microevolutionary changes in the 21st century as a consequence of changes in health care, nutrition and family environment. The most striking of those changes is the acceleration of growth and maturation producing adult bodies in early teenagers that, in modern systems of prolonged education and upbringing, are socially immature. This mismatch of adult bodies, including sexual behaviors, with a continued education and social dependence may produce health risks and psychological and social instabilities in formation of personal relationships and families. It may also generate difficulties in socialisation and workplace relations. Increased use of psychotropic substances, criminal behaviours and addictions are likely to develop when physically mature individuals have no opportunity to participate in normal adult life.

1. Change of child development is inevitable

The process of reproduction is the only way humans can continue to live. As old generations die out, fertilised ova turn into zygotes that undergo embryonic and foetal development producing newborn babies that grow and mature into adults of new generations. At every step of this process environment and human activities intervene. As these will continue changing into the future, next generations will be different from what is currently considered normal. The change is inevitable, we need to understand and control it. With increasing world population, the opportunity for mutations increased (Hawks et al. 2007) while human mortality declined so much that now the opportunity for natural selection is almost non-existent; 99% of individuals born at the beginning of the 21st century will be able to pass on their genes to the next generation, while a 150 years ago it was only about 50% (Saniotis & Henneberg 2011).

2. Uniqueness of human growth

Humans evolved unique stages of postnatal development: childhood and adolescence. For this reason the time taken to develop from birth to adulthood in humans is twice as long as that

among our closest animal relatives, the apes Bogin (2001). This prolonged period of development exposes growing humans to more environmental influences. Unlike apes, we do not develop directly into the juveniles from infancy, but at the end of infancy we enter a period of several years of relatively slow growth – childhood. This special period provides a developing individual time needed to learn abundant social and technical skills characteristic for human society while being sexually immature and physically small. Small physical size and sexual immaturity elicit caring behaviours towards children from adults and remove any suggestions of competitive threat to them. Only after childhood lasting approximately from about 2 to 7 years, humans enter the juvenile stage of life when they can take care of themselves but are still sexually immature. Juvenility ends at puberty which is another uniquely human developmental stage during which an organism is undergoing a profound change in terms of hormonal regulation of body functions and behaviour coupled with very fast growth towards adult size and form. The exact age at which those stages are achieved varies amongst individuals, and amongst populations. Growing humans show adaptability, that is the ability to adjust their growth to conditions which they encounter (Wells & Stock 2011). In poorer living conditions growth is slower and body size smaller. This allows survival when daily access to nutrition and other resources is limited.

3. Future Growth Acceleration

With the epidemiological and demographic transitions, of the last century and rapid economic development, growth of children and adolescents has accelerated (Fig.1). This phenomenon has occurred to a different extent in various countries.

The initial interpretation of this trend was that reduction of disease, psychosocial stressors and provision of better nutrition removed impediments to growth and development, and allowed the full genetic potential of individuals for growth to be expressed. It may be, however, that at least a part of these trends has been a result of specific factors increasing growth beyond its normal limits (Henneberg 2001a,b)

The advent of the 21st century has produced disturbing secular changes: very early sexual maturation (some girls start ovulating before age 10 years, even in developing countries like India and Kenya, the average age at the first menstruation is about 12.5 (Ogeng et al. 2011), catastrophically fast adolescence and hypermorphic body shapes (Bogin 2001). These are likely to be results of saturation of daily life with artificial substances and practices.

With the practical removal of any opportunity for natural selection through premature mortality (Saniotis & Henneberg 2011) and medical care correcting congenital problems, the genetic regulation of the course of individual growth and development will become more variable producing more variation in length of developmental stages and varying rates of growth. Since poor growth and slow development are traditionally considered abnormal, they are medically treated to correct them. Hence, naturally occurring longer development has a tendency to be medically shortened. The overall effect is likely to be shorter childhood, further acceleration of sexual maturation and very fast growth at adolescence. Early sexual maturation in girls, besides direct issues of sexual health is related to increased risk of cardiovascular diseases, cancers and metabolic problems in adulthood. Early pregnancies are an obvious result.

Offspring of very early pregnancies, especially in modern urban situations, lack normal family environments and thorough parental care and are at risk of developing psychosocial, as well as, health-related problems in later life. The overall effect of these changes may be declining biological status of future generations. This can be corrected and compensated for by medical procedures and technologies. However, health care systems must prepare themselves for this

challenge that is both demanding better knowledge and greater resourcing. The effort should concentrate on early sex education and efficient screening for sex-related behavioural disorders to prevent spread of sexually transmitted diseases and long standing sexual dysfunctions. Sex education should start at about 9 years of age and be provided by school systems openly and efficiently. This requires appropriate preparation of teachers and often difficult to achieve change of social mores that prevent open discussion of sex-related topics. Pediatricians should take every opportunity to advise parents about the need for providing full and frank advice about sexual development and sex life to their offspring at the very beginning of puberty.. It is very difficult to change the formal education system so as to accommodate the fact that 10-15 year old individuals more and more often are biological adults. No good models exist in the world

4. A Dangerous Mismatch

Besides biological consequences of physical growth deregulation there may be psychosocial consequences of reduced length of childhood and faster adolescence. With an increasing number of years required to educate members of modern societies, a serious gap is developing between biological and social maturity (Fig. 1) . Today preparation for a skilled job or for a professional career is completed only in early or mid-twenties of a person's life

Most individuals born in this century will become sexually mature before age 15 years. Thus, with requirements of educational and socio-economic progress, there will be a decade of life spent in a situation of mismatch between biological and social maturity. Besides health risks resulting from early sexual experiences this mismatch will have significant psychological and social consequences endangering the ability to form stable relationships and families and possibly producing difficulties in socialisation and workplace relations. Increased use of psychotropic substances, criminal behaviours and addictions are likely to develop when physically mature individuals have no opportunity to participate in normal adult life.

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Figure legend

Figure1. Upper: Acceleration of human ontogeny. All stages are achieved at an earlier age.century, Lower: Discrepancy between biological and social development of humans in the 21st

Figure 1.

