

FROM ANCIENT TIMES TO OUR DAYS: THE STATURE' STORY

Antik çağdan günümüze boy ölçümünün tarihi

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Öz

Boy ölçme Antik Çağ'dan beri bilinmekle birlikte, büyüme ile ilgili çalışmalar XVIII. yüzyıldan bu yana yapılmaktadır. Bu çalışmalardan sonra Avrupa'da ve ABD'de antropometrinin bir bilim haline gelmesi sanayi devrimi ile gerçekleşmiştir. Çağdaş multidisipliner yaklaşım çerçevesinde insan boyunun artışının değerlendirilmesi için yaygın olarak kullanılan standart büyüme eğrileri oluşturulmuştur.

Anahtar Kelimeler: Boy ölçümü, Antropometri, Büyüme çizelgesi

ABSTRACT

The measure of stature is mentioned in the Ancient times, but only since the 18th century the first studies on growth were reported. Anthropometry then becomes a science and developing along with the Industrial Revolution across Europe and the USA. Modern multidisciplinary approach is at the origin of the actual growth charts, commonly used for assessment of human stature increase.

Keywords: Stature, Anthropometry, Growth Charts

AIM

A global, comprehensive review was conducted about how and when Mankind dealt with growth and stature, and the progressive development of disciplines like Anthropometry and Auxology .

MATERIAL and METHODS

A bibliographic research was conducted through Review articles in Pubmed® using Medical Subject Heading (MeSH) terms : Growth , History , Anthropometry, Auxology ; during June 2016. A second approach used Google Scholar® with the same terms in titles. Major textbooks of Pediatric, Anthropology and Endocrinology were also consulted.

INTRODUCTION

The Mesopotamia civilizations were the first to be interested, in terms of measures, in the growth of children about 3500 BC¹. But it was during the 18th century that the first studies are reported: on limited cases (son of Count de Montbeillard) and on cohort (data collected from men enrolled in the Merchant Navy and the Royal Navy of England since 1786), introducing the further notion "secular" changes in human height along the last centuries^{2,3}.

THE "MEASURE of MAN"

The term anthropometry was first cited by Elsholtz (1623-1688): he gave this term a meaning of "able man" ; inspired by an instrument called "anthropometron" used two hundred years ago by the sculptor Leon Batista Alberti to measure the proportions of his statues⁴.

THE FIRST GROWTH CHART of a CHILD

The 18th century encompassed the first studies relating to the increase in human height: Jambert being considered as a pioneer with his writings in 1754^{4,5}. But the first-ever longitudinal study was reported in 1777 in the voluminous "Natural History": the author Georges-Louis Leclerc, Count de Buffon (1707-1788) reports the work of his assistant, Count Philibert Guéneau de Montbeillard, who measured the height of his son every six months since his birth in 1759 until adulthood^{5,6}. The growth of a child, from birth to adult size, designed as a "curve" was drawn from April 11th, 1759: the curious Count de Montbeillard measured and weighed his son at birth, then did the same at regular

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intervals, for eighteen years. These successive numerical values of stature were published in 1777 in the "Natural History", in the article "About Childhood", title III: "on successive increase in children"^{5,6}. From the collected data, the rate of growth of a child -from birth to maturity- could be deduced. These data expressed in older units have been converted into cm in 1927 by Richard Scammon^{5,6}. Using these periodic measurements, and operating conversion in centimeters, a growth curve can be obtained and notes that:

- The child measured 51.4 cm at birth,
- He started puberty at age 13 with a height of 155 cm,
- and achieved his growth with a final stature of 186 cm.

He has taken 31 cm during puberty, with an excellent development and even a superior adult height according to modern curves!

When Buffon mentioned it in a supplement to his "Natural History" (Figure 1), he probably not suspected that the growth increments of the young Montbeillard entered history, foreshadowing



Figure 1. The title page and the mentioned page regarding growth increment of Buffon's Natural History.

what ought to be obtained for each child: regular monitoring of its growth to establish a so-called « growth curve ».

The core principles of Auxology - Biometrics of Growth - are then explicitly stated: the same child is measured under similar conditions as possible and at regular intervals ("always barefoot," "with the same measuring rod, the same square and by the same person"). This curve is the first historical Growth Chart at an individual level.

In the other side of the Rhine River, in the same century, there was the famous study of the school of Carlschule in Stuttgart (1772-1777) of a group of elementary pupils. This was then the first longitudinal work on a cohort of children⁴.

QUETELET, GALTON and THE DEVELOPMENT of STATISTICS in the 19th CENTURY

In 1835, Lambert Adolphe Quetelet, born in Ghent in Belgium (1796-1874), published the first comprehensive statistical study on the growth in weight and height of children. (3) He introduced the use of the Normal Curve, also referred as a Gaussian Curve, to describe the distribution of growth measures (3,4). He also proposed, in 1870, in his document entitled "Anthropometry or measurement of different faculties of man," the Body Mass Index: weight / size, that still bears his name: the Quetelet index^{3,4}.

GALTON & the PERCENTILES

Galton (1822-1911) was also a leader using statistics, such as correlation analysis, to demonstrate the "heritability" of the human size. By presenting a diagram of the variation in size, he was the first to use percentiles to characterize an individual among a group or a cohort^{3,4}.

BIRTH of AUXOLOGY

In 1903, Paul Godin, in his essay entitled "Anthropometric research on the growth of various body parts" named «Auxology» the metric science of growth, and more specifically the "study of growth followed in the same subjects for many successive semesters by many measures". This term was coined from the botanic term: Auxin. By the end of the 19th century, Franz Boas noted that, throughout their growth, individuals could follow different routes far away from each other to achieve, *in fine*, similar statures. He introduced the concept of physiological age and proposed the term « tempo » to describe the various pace of growth⁴.

FIRST LARGE LONGITUDINAL STUDIES

Both sides of the Atlantic experienced the rivalry between the Old and New Continents through two eras of large longitudinal studies: the first era was in the US in the early 20th century and the second in Europe a few decades later. The pioneering study of the renowned « Welfare Research Centre of the Child of Iowa University », first led by Baldwin then by Meredith, began in 1917^{4,6} and highlighted the relationship between height, weight, vital capacity and school performance. Harvard references stem from this work were cited by Jelliffe in 1969^{4,6}. The second wave of auxological studies occurred in the middle of the twentieth century when seven different European countries (France, Sweden, Finland, Czechoslovakia, Poland, Hungary, Scotland) followed the same protocol coordinated by the International Children's Center in Paris^{3,4}.

MODERN APPROACH

Louis René Villermé, a pioneer statistician of public health in the early 19th century, noted that the height of a population correlated positively with the productivity of the soil: "physical stature is greater, and men grow faster, the wealthier is the country; in other words, misery produces short people, and delays the achievement of final height"³. Nearly two hundred years later, in the 1970s, a novel aspect of anthropometry emerged when historians and economists highlighted, just like Villermé, the evolving role of socio-economics, political crisis and war periods.

This approach reinforced the concept of "secular gain" in height reported in industrialized countries during the last three centuries; as mentioned since the British Navy Registries³. Then, since the years 1980-1990, a much more mathematical aspect is adopted via methods such the so called LMS (Lambda-Mu-Sigma) method, that generates fitted curves following closely the empirical collected data⁷. These methods, in agreement with most public health specialists, were used in several national reference growth charts around the world, including those of the Centers of Diseases Control and prevention (CDC) in 2000 in the United States and those (widely cited as references) of the World Health Organization, WHO, in 2007^{4,5}.

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