



ISSN: 2456-0057

IJPNE 2020; 5(2): 77-81

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Received: 26-04-2020

Accepted: 14-06-2020

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## Human physique (hai'at): An essential parameter for temperament assessment: Then and now

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### Abstract

Temperament (Mizaj) is the core concept of Unani system of medicine bearing a direct relationship with the personality of an individual. This study of human temperament began around 6<sup>th</sup> century BC with Hippocrates, and since then, scholars contemplated various factors that can assist in the determination of human nature. One such factor is physique that always intrigued philosophers and thinkers who tried to understand the human nature. Thus, many of the Unani physicians included it as a criterion of temperament assessment. Although, eras might have changed but human physique never ceased to amaze the people. Earlier people used to classify individuals based on temperaments and attributed certain qualitative physical traits with each of these temperament. But now the scenario has changed with research based advancements in science, and methods have progressed to quantitative classification of human physique based on anthropometric studies. This paper is an attempt to bring all those personalities on a single platform who have made any effort to understand human physique.

**Keywords:** Ajnas-e-Ashra, Haiyat-e-Aaza, somatotype, temperament, unani medicine

### 1. Introduction

Humans are undeniably the most intellectual of all the species present on the face of the Earth. Ever since its creation, man has been questioning the world around him. Hence, in this quest he has also sought answers pertaining to human body and tried to quench his curiosities with constant reasoning. Unani System of Medicine is one such system that came into existence through thorough inquiries into human nature. Hippocrates (460–377 BC) is credited to be the pioneer of this system of medicine separating it from the realm of superstition and establishing it as a branch of science. It has a holistic approach based on theories that distinguishes it from other existing systems. One such theory is temperament, which holds that every single entity on the earth is different from the other based on its specific composition. Since, the concept of temperament is very crucial in terms of maintenance of health as well as management of disease, great emphasis was put on deducing methods for determining the temperament. Many of the great scholars came up with three to four criteria, except Ibn-e-Sina, who gave "Ajnas-e-Ashra", the infamous ten parameters for assessing temperament of a healthy human.

### 2. Haiyat-e-Aa'za (Physique) as a determinant of Temperament (Mizaj)

Temperament and physique are positively correlated as body types are by nature "summaries" of many characteristics <sup>[1]</sup> and for at least two thousand years, people have believed that a man's character is revealed by his body <sup>[2]</sup>. The morphological and structural differences among human beings are unique and that is why no two humans are alike in body form. Even the identical twins (monozygotic) can be identified from each other although they develop from the single ovum and share exactly similar genetic information. These large differences in body form, morphology and physique in humans must form the basis for any attempt at classification and analysis of human physique. Pauline M. Alt states that human personality is a diverting subject for study, which leads its students to consider one phase, then another; to find one clear facet only to note that the new obliterates the old and that much confusion follows. However, one point of interest, which seems to have persisted since early times is the study of the relationship of physique and temperament <sup>[3]</sup>.

The Greek physician Hippocrates divided men into two physical types viz., phthisic habitus (long and thin) and apoplectic habitus (short and thick), and suggested that men with the phthisic physique are particularly susceptible to tuberculosis while apoplectics are predisposed to diseases of the vascular system. He also believed that these types varied temperamentally as well as physically<sup>[4, 5]</sup>. From the time of Hippocrates until today, there is a continuous quest to find out and establish a relationship between men's temperament and their hai'at (physique). Probably that is why Hai'at-e-Aa'za remained the most important parameter of temperament determination. Even the ten parameters of temperament determination (Ajnas-e-Ashra) proposed by Ibn-e-Sina are incomplete without it as it not only reflects the temperament but also directly helps in its assessment<sup>[6]</sup>.

### 3. Haiyat-e-Aa'za (Physique) in classical Unani texts

Physique is sometimes used equivalent to Hai'at-e-Aa'za, which is an important stepping-stone in the path of assessing one's temperament that deals with the shape, size, structure and appearance of the human body as a whole or its parts. The Greco-Arab physicians have clearly mentioned in their texts as to how the physique can be of help in determining the temperament. Views of some scholars about Hai'at-e-Aa'za were as mentioned below:

According to Galen (129-200AD), people with average built possess nearly moderate temperament, whereas, people with Hot & Dry Temperament are thin with good height while people with Cold & Moist Temperaments are flabby and Fatty. He further goes on to explain that the excess of bile results in thin and emaciated bodies, whereas excess of blood is responsible for a beautiful face and jolly nature<sup>[7]</sup>.

Rabban Tabri (770-850AD) in his book "Firdaus-al-Hikmat (Paradise of Wisdom)" stated that excess of heat dries body fluids resulting in long and morphologically well shaped individuals. Their nose is thin and tongue is delicate. The residents of colder areas possess an excess of cold, which solidifies their body fluids, leading to an average body built in excess of fats. The inhabitants of mountain possess an excess of dryness along with cold, so they are of small stature<sup>[8]</sup>.

Zakariya Razi (850-923AD) in his Kitab-al-Mansoori says that the body physique of equable temperament individuals is nearly ideal for instance the blood vessels are neither too prominent nor too concealed. The growth and development in hot temperament is quick, leading to a fully developed body in all aspects. In Cold individuals, there is a slower growth and development. Body with is fatty indicates moist temperament and an emaciated body suggests dry temperament<sup>[9]</sup>.

Ali Ibn-e-Abbas Majusi (930-994AD) says that a person bearing a moderate temperament is neither fat nor thin. He further added that when there is more fat content and lesser muscle mass then the temperament is cold but moderate with respect to moisture and dryness. Vice-versa indicative of hot temperament with moderate wetness and dryness. An abundance of fat and muscles suggests a temperament equable in hot-cold qualities but dominant in moisture content. Similarly, an emaciated body tends to be moderate in hotness and coldness but has more of dryness than moisture.<sup>[10]</sup> In Kitab-al-Maliki, Majusi penned down that muscles covering the shoulder be keenly observed as in some cases, there may be well developed muscle mass with thin bones, giving a false indication of a thin body type or vice versa<sup>[10]</sup>.

Abu Sehal Masihi (960-1000 AD) says that temperament of muscles is warm and moist. While the muscles of children

have more wetness, young have relatively more heat in their muscles, and muscles of elderly have a relatively dry temperament<sup>[11]</sup>.

Ibn-e-Sina (980-1037 AD) mentions in Al-Qanoon fit-Tibb that hot temperament individuals possess broad, large and well developed chest, prominent blood vessels with while hand and feet are not narrow and short<sup>[12, 13]</sup>. The muscles around the joints are big because all the functions of growth and constitutional forms are accomplished by heat. The Cold temperament individuals possess opposite characteristics because, owing to cold, the natural faculties are inadequate to complete the functions of growth and creation. The persons of dry temperament have dry and rough skin, prominent joints, and prominent cartilages of trachea and nose.

Ahmad Hasan Jurjani (1041-1136 AD) says that people of hot and wet temperament possess an excess of flesh. Their blood vessels are prominent. If the consistency of organs and muscles is hard or tough, then it indicates dryness of mizaj. Hot and dry people have a broader chest. Qualities contrary to hotness and dryness indicate have opposite characters. Characteristics in between the above mentioned features i.e., a moderate body built is a sign of equable temperament<sup>[14]</sup>.

Ibn-e-Rushd (1126-1198 AD) writes in Kitab-ul-Kulliyat also described the same features of human body as mentioned by Ibn-e-Sina. He says, "a body with moderate temperament is neither fat nor thin, but in between the two"<sup>[15]</sup>.

Hakim Abdul Latif in Tajdeed-e-Tibb write that all people have their own psycho-somatic characteristics and their appearance is different from one another, which means that each and every individual possesses its own specific temperament responsible for the differences in his functions, behaviour, appearance and thinking. This particular temperament is considered to be the specific temperament of that man<sup>[16]</sup>.

Syed Ishtiyag Ahmad says that temperament influences body physique, therefore the development of different bodily organs and their built is because of their specific temperaments. Therefore, anatomically four body types (habitus) of personalities that are probably influenced by their respective temperaments are Hypersthenic type, Sthenic, Hyposthenic type, Asthenic type<sup>[2]</sup>.

Hakim Iftikharul Haque Takmili says that there is an inseparable relationship between temperament and physique. Although every organ has a specific shape and structure essential to its existence and functioning, failing to which no organ can normally form. But, it does vary from person to person with the limits of normalcy and owing to this difference apparent to naked eyes, different personalities are determined. This variation of structure and shape is also present amongst the internal organs, but that is not taken into account for assessment of individual temperament<sup>[17]</sup>.

He then added that a person of hot and temperament has broader thorax with optimally developed limbs and thick musculature covering the joints. Whereas, an individual of cold temperament possess contrary characters. A dry temperament is indicated by lack of glow and dull features, exposed joints, prominence of nasal and tracheal cartilage. About moist temperament, he explains that development of organs cannot be achieved only through heat, but it also requires moistness. Therefore, indications of moistness are those of hot temperament.

While describing human physique he quoted Ibn-e-Sina that there is a direct relationship between body built and mizaj. He says that there is range i.e., an upper and lower limit of temperament in between which a particular temperament

dwells. If mizaj falls out of these limits, then it will lead to an imbalance in the temperament of body organs [18].

#### 4. Classification of Physique

The notion of classifying physique into some meaningful system has considerable appeal providing stimulus for repeated efforts in this direction. Interest in classifying human physique dates from at least the time of Hippocrates, and since then, various systems have been developed. William Damon (1970) gave several reasons for studying body form (physique) in relation to constitutional medicine; to predict in advance susceptibility and response to disease and therapy, to obtain clues to mechanisms underlying a detected association, to elucidate causes, and to identify several places in the web of causation at which intervention can help prevent disease [1, 19].

There are several methods for describing the characteristics of the human body, including its classification according to the appearance or metric characteristics. Somatotyping is one such method used to appraise body shape and composition and is probably the best way to describe Hai'at-ul Aa'za in contemporary era.

The term "somatotype" was coined by William Herbert Sheldon in collaboration with S. S. Stevens and W. B. Tucker in his book 'The varieties of Human Physique, An Introduction to Constitutional Psychology' in the year 1940. [20,21,22,23] It was defined as the quantification of the three primary components determining the morphological structure of an individual expressed as a series of three numerals, the first referring to endomorphy, the second to mesomorphy, and the third to ectomorphy [20, 21, 22, 23].

According to Sheldon *et al.*, somatotypes are morphophenotypic ranges along continua of variation, which possess constantly recognizable characteristics and are the functional end products of the whole genetic and developmental complex [20, 24]. This issue can be summarized in the words of Tanner as, "the problem in the classification of body shape is that it is difficult to measure and quantify, although it is relatively simple to observe" [25].

#### 4.1 Methods of Somatotyping

Although the origin of somatotyping and anthropometry is very ancient, but the scientific anthropometry began only around 250 years ago with Johann Friedrich Blumenbach (1752-1840), who laid the foundations of Craniology.

Then, in the 17<sup>th</sup> century, J. S. Elsholtz a German physician coined the term 'anthropometry' [26] and established a method for taking body measurement that encompassed a wide variety of measurement procedures for determining a number of body dimensions [20]. Anthropometry is said to be the quantitative interface between anatomy and physiology.

Approximately 200 years after Elsholtz, Quetelet became the first anthropometrist to statistically study the body measurements.

Then in the late 19<sup>th</sup> century, di Giovanni carried out a long series of anthropometric studies in the school of clinical anthropology founded by him at the University of Padua [20].

Later on an Italian physician Viola who was the pupil of di Giovanni differentiated three morphological types viz., macrosplanchnic, microsplanchnic and normosplanchnic. Of these he observed macrosplanchnic to be approximately the same as habitus apoplecticus, whereas, microsplanchnic were similar to habitus phthisicus [20, 21].

i) Macrosplanchnic (Brachitype): This type was characterized by massiveness and robustness of body

with short limbs relative to trunk, short transverse diameter relative to the antero-posterior diameter, and short thorax relative to the abdomen

ii) Microsplanchnic (Longytype): They had long limbs relative to their trunk volume, large thorax relative to their abdomen, a large transverse diameter relative to anterior posterior diameter.

iii) Normosplanchnic (Normatype): The normatypes were in between the above two types, characterized by normally proportional limbs versus trunk, thorax versus abdomen, transverse versus anteroposterior widths.

Huter (1880) presented another important trichotomous classification of the 19<sup>th</sup> century, dividing people into cerebral, muscular and digestive types with predominating ectodermic, mesodermic and endodermic structures respectively [20].

German psychiatrist, Ernst Kretschmer in the first edition of his "Körperbau und Charakter" (Physique and Character) in the year 1921 described four physical and psychic types viz., pyknic, athletic, asthenic and dysplastic physiques. Later asthenic was substituted with leptosomic [20, 21, 27].

i) Pyknic type is typically short and thick with large body cavities but short extremities, round chest and their body is generally well padded with fat.

ii) Athletic physique has a well developed musculature and bony structure and the body is generally well proportioned.

iii) The leptosome is characterized by linearity of trunk, limbs, and face. The bones are small and there is little musculature.

iv) Dysplastic category covers individuals with incongruous admixtures of the other three types.

Sheldon recognized that every individual instead of being a particular somatotype was a mixture of all the three basic components of physique that were present in varying degrees in them [28]. He believed that the somatotype is the trajectory that an individual follows provided average nutritional conditions and absence of any major illness [20]. He originally named these three body types as pyknosomic, somatosomic and leptosomic and later replaced them with endomorphy, mesomorphy and ectomorphy, which can be understood as follows:

i) Endomorphs reflect that component of physique, which is derived from the innermost embryonic layer, endoderm, with predominance of soft roundness throughout the various regions of the body. Endomorph's digestive viscera are highly developed while the somatic structures are relatively weak and undeveloped. They have lots of body fat and muscle, and tend to gain weight easily. They don't have to necessarily be overweight [20, 22, 23, 29].

ii) Mesomorphs is an individual having a body type in which tissues derived from the mesoderm predominate. Such a physique is normally heavy, hard, firm, upright, and relatively strong and tough with a rectangular outline. Blood vessels are large, especially the arteries. The skin is relatively thick as it is heavily reinforced with underlying connective tissue and skin pores are large. They are neither overweight nor underweight, as they tend to gain and lose weight without too much effort [20, 22, 23, 29].

iii) Ectomorphic component is dominant when fragility, linearity, flatness of the chest and delicacy throughout the body are found. There is relatively slight development of



both the visceral and somatic structures. The ectomorph has long, slender, poorly muscled extremities with delicate, pipe stem bones, and he has, relative to his mass, the greatest surface area and hence the greatest sensory exposure to the outside world and largest brain and CNS. His nervous system and sensory tissue have relatively poor protection. Thus, the body is dominated by tissues derived from ectoderm. They have a hard time gaining weight. Such individuals would have a small face, a petite nose, and finely textured hair. The features derived from ectodermic layer like the skin, nails and sensory organs are most prominent in ectomorphs [20, 22, 23, 29].

Reviewing Sheldon's "The varieties of Human physique" and "The varieties of Temperament", Nathan Israeli stated that these works make one continuous report from which Constitutional Psychology emerges with the aims of describing and interpreting the constitutional pattern of the individual personality [30].

During 1940s, Hooton (1951) modified Sheldon's somatotype method and used the term 'body-build' instead of somatotypes. He made ratings based on height-weight ratio and inspection of standard somatotype photographs and defined components as: [20, 31].

First component deals with the concept of fat development; second was the concept of Bone size and muscle relief; and Third dealt with the concept of Relative attenuation or elongation of body.

Bullen and Hardy (1946) derived a checklist of 105 specific points from Sheldon based on observable criteria for predominance of a component. Their endomorphy rating ranged from 1 to 6; mesomorphy from 2 to 7 and ectomorphy from 1 to 7 [20, 32].

Cureton (1947) devised a somatotype method that combined inspectional ratings of the photographs, palpation of the musculature, skinfold measurements, HWRs, and assessments of strength and vital capacity. He also developed an abbreviated checklist for somatotype rating. Cureton's simplified physique rating method rates External Fat, Muscular Development and Condition, Skeletal Development on a scale of 1 to 7 [33, 34].

Dupertuis & Emanuel (1956) elaborated on the criteria of the Sheldon defining endomorphy as soft roundness, mesomorphy as muscularity & solidity and ectomorphy as linearity and delicacy [20, 35].

Parnell (1954, 1958), a British physician was the first to use anthropometry to derive somatotype ratings that would correspond with the photoscopic ratings of Sheldon. His effort was to describe a short physical anthropometric method for obtaining somatotype [20, 36, 37]. Their method of estimating dominance of somatotype components chiefly depends on Standard Deviation Chart, designed based upon the anthropometric data obtained from 405 undergraduates at Oxford and Birmingham.

Heath (1963), who was a research associate with Sheldon from 1948 to 1952, critically examined the shortcomings in Sheldon's method and suggested alterations and modifications in it. Later on in 1967, Heath and Carter ended up giving their own method of somatotyping, which evaluates the body form or physique at the given time compared to the unchanging somatotype of Sheldon [20, 38]. According to Heath and Carter, somatotype is the "quantification of the present shape and composition of the human body expressed in a sequential rating of three numbers, each representing the evaluation of

three primary components of physique (endomorph, mesomorphy and ectomorphy), always in the same order which describe individual variations in human morphology and composition". [1, 20, 39, 40]. The first component indicates endomorphy i.e., the relative fatness, the second component indicates mesomorphy or relative musculo-skeletal robustness and the third component indicates ectomorphy, which is the relative linearity or slenderness of a physique.

## 6. Discussion

Human physique has always been a point of interest for those who want to study human nature because no two people in this world are alike, not even identical twins. Also, there is a strong association of temperament with morphology and constitution and this difference is equally present in internal as well as external organs. In Unani Medicine, it is believed that the temperament of each person influences his physical and physiological properties. On this basis, many great scholars of this system presented the physical characters of different temperaments. Physique was a greatly emphasized trait because the shape and structure of human body as a whole or of its parts is the first thing that comes into the contact of a physician, and on inspection, a physician can easily evaluate the behavioral and psychological traits to a greater extent. So, the understanding of body physique has always been an important tool in assessing the temperament. However, this assessment was almost always subjective. But with the introduction of anthropometry over the past few centuries, human beings have been quantitatively categorized into various somatotypes, Heath and Carter's somatotypes being the most recent one. Incorporation of these anthropometric methods in quantitative assessment of different temperaments can greatly benefit the Unani system of medicine by providing measurements not influenced by subjective errors and prejudices.

## 7. References

1. Carter JEL *et al.* Advances in Somatotype Methodology and Analysis, Yearbook of Physical Anthropology. 1983; 26:193-213.
2. Montemayor R. Men and Their Bodies: The Relationship between Body Type and Behavior, Journal of Social Issues. 1978; 34:1.
3. Pauline Alt M. Relationship of Physique and Temperament, The School Review. 1953; 61(5):267-276. <https://doi.org/10.1086/442015>
4. Hippocrates. On Ancient Medicine: The Genuine Works of Hippocrates. Translated by Francis Adams. New York: Wm. Wood & Co., 1886.
5. Physique And Temperament - Factors In Behavior retrieved on 5.10.18 @ 12:55 p.m. <http://psychology.jrank.org/human-behavior/pages/cmxyrrzxxk8/physiquetemperament-factors-individual.html>
6. Qadeer A. Matab aur Shakhshi Mizaj Shanasi, Jahan-e-Tibb CCRUM, New Delhi, 2001, 14-17.
7. Galen Kitab-Fil-Mizaj. edited & translated by Syed Zillurrahman, International printing press, Aligarh, 2008, 138-140, 148-149.
8. Tabri Rabban, Ali Bin Sahal, Firdaus-ul-Hikmat. Urdu translation by Mohd. Adl Shah Sambhali; Faisal Pub., Deoband, 2002, 58, 59, 88.
9. Razi Z. 'Kitab-Al-Mansoori', Urdu Translation, CCRUM, New Delhi, 1991, 59-80.
10. Majusi, Ali Ibn Abbas, Kamil-us-San'a-fit-Tibb. Urdu

- Translation by Ghulam Husain Kantoori, Idara Kitab-us-Shifa, New Delhi, 2010, 25,
11. Masihi Abul Sehal, Isa Bin Yahya Bin Ibrahim, Kitab al Meyat Fil Tib. Part- I, Islamic Publication Society, Hyderabad, 1963, 82, 98.
  12. Gruner OC. A Treatise on the Cannon of Medicine of Avicenna, Luzac and Company, London, 1930, 57, 63-64, 264-273.
  13. Ibn-e-Sina, Al Qanoon fil Tibb. Book-I, English translation of the critical Arabic Text, Jamia Hamdard, New Delhi, 1993, 7-13, 65, 190-197.
  14. Jurjani AH, Zakhira Khwarizam Shahi. Urdu translation by Hadi Hassan Khan, Matba Nami Nawal Kishore, Lucknow. 1902; I:14, 18-25.
  15. Ibn-e-Rushd M, Kitab-A1-Kulliyat. Urdu Translation, CCRUM, New Delhi, 1980, 35, 156, 157, 159.
  16. Latif Falsafi A, Shifa ul Mulk, Tajdeed-e-Tibb. Edited by Hkm. Syed Zillur Rehman, Ala Press, Delhi, 1972, 49, 85.
  17. Ahmad SI. Al-U Moor-Al-Tabi'yah, 1st Edition, Saini Printers, New Delhi, 1980, 16-18, 27, 37-40, 42, 59-60, 63.
  18. Takmily IH, Tibb-e-Qadeem Ka Mabhas-e-Mizaj-e-Insan. Nizam Press, Lucknow, 1994, 39, 274.
  19. Damon A. Constitutional medicine. In O von Mering and L Kasdan (eds): Anthropology and the Behavioral and Health Sciences. Pittsburgh: University of Pittsburgh Press, 170, 179-195.
  20. Carter JEL. Barbara Honeyman Heath. Cambridge studies in Biological Anthropology, Somatotyping: Development and Applications, Cambridge University Press. 1990; 2:30.
  21. Kapoor. Satwanti Unit-3 Human Constitution And Physique, 2017, 39-48. <http://egyankosh.ac.in/handle/123456789/41429>
  22. Dr. William Sheldon. on Constitutional psychology; retrieved on 1.10.18 at 10:02 a.m. <https://www.age-of-the-sage.org/psychology/sheldon.html>
  23. Winthrop H. The Journal of General Psychology, 1945, 33, 157-166. Critical Reviews of Recent Books Sheldon, W. H. The Varieties of Temperament. New York: Harper, 1942, 520.
  24. Sheldon WH, Stevens S, Tucker WB. The Varieties of Human Physique. New York: Harper, 1940.
  25. Tanner JM. Growth and constitution. In AL Kroeber, ed.: Anthropology Today. Chicago: University of Chicago Press, 1953, 750-770.
  26. Nath S. Anthropometry- The measurement of body size, shape and form, Friends publication, New Delhi. 2015; 1:15.
  27. Kretschmer E. Physique and Character; An investigation of the Nature of Constitution and of the Theory of Temperament; Translated from the second German edition by W. J. H. Sprott. New York: Harcourt, Brace & Co., 1925.
  28. Bailey DA, Carter JEL, Mirwald RL Somatotypes of Canadian men and women. Hum. BioI. 1982; 54:813-828.
  29. Tracking the Elusive Human, Chapter 4: William Sheldon's Body and Temperament Types, I. retrieved on 1.10.18 @ 10:35 a.m. <http://www.innerexplorations.com/catpsy/t1c4.htm>
  30. Nathali I. The Journal of General Psychology. Critical Reviews of Recent Books Sheldon, W. H. The Varieties of Temperament. New York: Harper, 1942, 520, 1945; 21:283-287.
  31. Hooton EA. Handbook of Body Types in the United States Army. Cambridge: Harvard University, Department of Anthropology, 1951.
  32. Bullen AK, Hardy HL. Analysis of body build photographs of 175 college women. Am. J Phys. Anthropol. 1946; 4:37-65.
  33. Cureton TK. Frederick William Kasch. Physical fitness appraisal and guidance, Henry Kimpton: London; printed in America, 1947.
  34. Roy Shephard J. An Illustrated History of Health and Fitness, from Pre- History to our Post Modern World, 39.
  35. Dupertuis CW, Emanuel I. A Statistical Comparison of the Body Typing Methods of Hooton and Sheldon. U.S. Air Force, Wright Air Development Center. WADC Technical Report 56366 (ASTIA Document AD 97205), 1956.
  36. Parnell RW. Somatotyping by physical anthropology. Am. J. Phys. Anthropol. 1954; 12:209-239.
  37. Parnell RW. Behaviour and Physique. London: Arnold, 1958.
  38. Hartman T. Color code Personality Science; The History of Personality Theory and Assessment, 3-4. <https://www.colorcode.com/media/whitepaper.pdf>
  39. Carter JEL. Barbara Honeyman Heath The Heath-Carter Anthropometric Somatotype Instruction Manual.
  40. Singh SP. Somatotype and Disease: A Review Anthropologist. 3:251-254.