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# RISE AND FALL OF ACHILLE DE GIOVANNI'S CLINICAL ANTHROPOMETRY

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**Abstract.** Achille de Giovanni (1838-1916), Italian clinician and pathologist, developed a constitutional method for clinical investigations based on the morphology of the human body. He was the first to use anthropometry with living patients with the aim of evaluating the relationship between form and function, between organic structures, physiology and pathology, for understanding “individuality” in a scientific way. His clinical anthropometry gained some popularity during his life, but was completely forgotten few decades after his death. By consequence, he can be considered a loser from the point of view of the long-term impact of his theories and practices, but at the same time, some of his ideas could be still valid today.

**Keywords:** Achille de Giovanni, medical anthropometry, constitutional medicine, racial hygiene

## Introduction

The period between the late nineteenth and the mid-twentieth century can be characterized as a period of transition for western medicine. From the one hand, the methodological revolution of laboratory medicine was definitively acquired, which probably represents the most dramatic change along the whole millennial history of that science. From the other hand, new and unequivocal results in terms of therapeutic achievements were yet to come.<sup>1</sup> During this period, cellular pathology and bacteriology established new criteria for the understanding of human diseases. If the stethoscope represented a nineteenth century innovation which remained related to the Hippocratic tradition of bedside medicine, the microscope can be viewed as the instrument which better embodied the scope and methods of the new laboratory medicine. Only through the microscope, diseases could be defined, other than diagnosed, in terms of diseased cells or bacteria infecting human tissues. The focus of medical investigation, by consequence, passed from the living bodies of patients, to the cells of their tissues, the analysis of which seemed no more necessitating a careful inspection of patients' symptoms and history.<sup>2</sup>

Laboratory medicine allowed, at the beginning, an extraordinary development in the diagnostic field. At the same time, however, only few diseases became treatable thanks to these advancements. A new era of medicine in terms of therapeutic achievements, in fact, started only from the middle of the twentieth century. In that

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period antibiotics, new surgical instruments and procedures were introduced, which revolutionized western medicine and contributed to the improvement of life span of industrialized populations.

In the period between the late nineteenth and the mid-Twentieth century, the methods and scopes of laboratory medicine were accepted by the most part of scientific community, however some physicians remained sceptical and, supported by the lack of therapeutic achievements, tried different ways of thinking. In particular, Homeopathy,<sup>3</sup> Darwinian medicine,<sup>4</sup> and Constitutional medicine can be characterized as alternative approaches to laboratory medicine which developed in this long period of transition.

Among them, I will focus in this paper on Constitutional medicine and, in particular, on one of its pioneers, namely the Italian clinician Achille de Giovanni (1838-1916). He developed a constitutional method for clinical investigations based on the morphology of the human body which gained some popularity during his life, but was completely forgotten few decades after his death. By consequence, he can be considered a loser from the point of view of the long-term impact of his theories and practices, but at the same time, some of his ideas could be still valid today.

### **Constitutional Medicine**

The scientific context in which constitutional medicine emerged is strictly related with the debate around the new science of microbiology which animated medical community in the last quarter of nineteenth century and the first decades of the Twentieth century. Even if the possibility that microorganisms existed was discussed for many centuries before their actual discovery in the Seventeenth century, microbiology as a medical discipline was founded not before the work of Louis Pasteur (1822-1895) and Robert Koch (1843-1910). They demonstrated the validity of the so-called *germ theory of diseases*, according to which microorganisms were the causes of many pathologies. The germ theory became a sort of universal model for the understanding of human pathology,<sup>5</sup> founding an *ontological concept of disease*, according to which diseases were real entities belonging to the natural world which affected human bodies from outside.

However, the growing success of the germ theory was not a linear process without resistance from the scientific community. Bacteriologists, clinicians and pathologists became even more aware that individual susceptibility was at least as much important as the presence of the germ for causing infectious disease. The most common metaphor for describing this concept, was that physicians had to analyse not only the seed (germ), but also the soil (body) for understanding how and why infectious diseases arisen. This differential susceptibility often went under the name of constitution.<sup>6</sup> Some clinicians adopted, other than bacteriology, also anthropology as reference model for their investigations, in particular the branch of anthropometry through which they could measure, compare and analyse internal and external shapes of human bodies in relation with health and disease. To the ontological model of disease, a clinical model was opposed, based on the concept of individuality revealed by anthropometric indexes.

The problem of human constitution, and the role of its hereditary and acquired characteristics in causing all sort of diseases, became the central argument of an important number of physicians between the end of the nineteenth and the first decades of the Twentieth century. Pioneers of this approach were physicians belonging to the German school of medicine, such as Friedrich Wilhelm Beneke (1824-1882), Friedrich Martius (1850-1923) and Julius Bauer (1887-1979), and the already mentioned Italian Achille de Giovanni. The German epidemiologist Adolf Gottstein (1857-1941) in his *General Epidemiology* of 1897 proposed an influential formula of disease causation:  $C/p$ , where  $C$  stands for constitutional strength,  $p$  for the parasite's degree of pathogenicity, and disease resulted whenever the ratio was less than one. Martius adopted this formula for all pathological processes.<sup>7</sup>

The specificity of constitutional approach, compared to previous studies on temperaments and diatheses, was the use of the quantitative method.<sup>8</sup> Constitutional medicine was mainly based on measurements of the different proportions of the body during its development, with the aim to establish the relationship between how forms developed, determined organic functions and pathological dysfunction. Anthropometric methods were the basis for supporting that constitutional medicine consisted of the new "science" of individuality. Measurements of the human body were objects of different disciplines even before the birth of constitutional medicine, but the premises and results of these measuring had nothing in common with those made in the medical field.<sup>9</sup> Anthropology, for instances, used measures to find traits by which combining individuals in groups such as populations and species, while constitutional medicine used measures, on the contrary, to distinguish individuals among them, to separate and compare individual differences, in particular for the understanding of individual susceptibilities.<sup>10</sup> In the hands of clinicians, anthropometry passed from a descriptive function to a diagnostic instrument for prophylaxis and prevention. Constitutional clinic emerged as a broad, complex and articulated "research program" with the aim of correlating physical and psychical individualities, individual variabilities of defences and susceptibilities against diseases.<sup>11</sup>

### **Achille de Giovanni and his new clinical science**

The idea of evaluating the human constitution as a factor favouring diseases, born within German pathology school and the work of Friedrich Wilhelm Beneke, pathologist working at Marburg, who during the 1870's carried out comparative measurements of internal organs and somatic characteristics in hundreds of cadavers, with the aim of finding significant correlations among anthropometric and clinical data.<sup>12</sup> However, the study based on cadavers allowed only for descriptive evaluations without the possibility to appreciate physiological functions. The transfer of data taken from cadavers to living patients was equally problematic. Achille de Giovanni was the first to use anthropometry with living patients with the explicit aim of evaluating the relationship between form and function, between organic structures, physiology and pathology. Moreover, the approach of De Giovanni was original because focused on the attempt of understanding "individuality" in a scientific way, while the constitutional German school was rather focused on defining types of men by establishing shared characteristics among individuals.

De Giovanni, born in Sabbioneta (Mantua), entered at the University of Pavia for studying pharmacology. He moved to the study of medicine, graduating at the University of Mantua in 1862, and then he practiced clinic and pathology in Bologna, Milan and Pavia between 1863 and 1871. In 1872, he became professor of general pathology at the University of Pavia, position that he held until 1876, when he was called at the University of Padua as professor and director of the Institute of Medical Clinic. He became also Head of the Medical Faculty (1885-1886) and Dean of the University (1896-1900).

The scientific formation of De Giovanni was done in the period of twenty years between 1860 and 1880. With regard to medicine, this period was characterized, from the one hand, by the development of the anatomo-clinical method through percussion and auscultation and, from the other hand, by the introduction, as already mentioned, of laboratory medicine. With regard to biology, this period saw the birth of the Darwinian theory of evolution and the development of anthropological sciences based on anthropometrical methods.<sup>13</sup> De Giovanni was influenced in different ways by all of these approaches, except the laboratory medicine, which in Italy was adopted later than other European countries.<sup>14</sup> During his studies at the University, he embraced an evolutionary perspective by studying Lamarck's *Philosophie Zoologique*,<sup>15</sup> according to which the most important principle of life was its capacity of changing and developing new adaptations both at individual level and at the level of species. This author was determinant for his choice of passing from pharmacology to medicine, with the aim to studying the "animal-man" as the "last link in the zoological chain".<sup>16</sup> In 1869, he published a book on percussion and auscultation, which he practiced extensively during his residencies at the Hospitals of Pavia and Milan<sup>17</sup> and then he used for detecting geometrical shapes of internal organs.<sup>18</sup> Moreover, in Pavia he was influenced by the morphological studies on man and animals of the anatomist Bartolomeo Panizza (1785-1867).<sup>19</sup>

The delay in the introduction of laboratory medicine in Italy did not prevent De Giovanni to enter in the European debate around bacteriology. On the contrary, the dispute around "seeds" and "soils" in the causation of infectious diseases was fundamental for his studies on human constitution. The essential problem at the base of his clinical method, in fact, was related to the variability of clinical manifestations which could not be understood within the limits of organ pathology and the pathogenic activity of microbes, given that different individuals reacted in different ways to the same pathogenic lesion.<sup>20</sup> For instance, on the role of Koch bacillus in the causation of tuberculosis, De Giovanni advanced that this germ "represented the tubercle, but not tuberculosis in the proper clinical sense, where constitution and different inclinations of the nervous system are crucial".<sup>21</sup> The basic principle of De Giovanni's clinical practice and pathology was definitively oriented on the study of individual morphology: "the reason of the special morbidity of organisms stays in their specific morphology".<sup>22</sup> Moreover, being morphology a feature which could be the object of a quantitative analysis, it was the key aspect for refunding clinical investigation on a scientific basis which could be autonomous, complementary or even alternative to laboratory medicine and bacteriology. It is important to underline, however, that De Giovanni fully recognized the importance of microbes and their

study. He even stated that human body was the theatre of bacteria's struggle for life.<sup>23</sup> At the same time, he was convinced that individual susceptibility was the key factor of infectious disease. He arrived to support that in tuberculosis both symptoms and predisposition were related to the special morphology of the individual.<sup>24</sup> To that disease, he gave an important contribution in terms of public health, advocating the foundation of the *Lega Nazionale Contro la tubercolosi* (Italian League Against Tuberculosis).<sup>25</sup>

The crucial point of De Giovanni study was his attempt to systematically correlated morphology with function and development. Far to be a static feature, in his mind morphology was the principle unifying embryology, heredity, physiology and pathology. This research program started with De Giovanni's studies on nervous and neurological diseases, carried out since his residency at the Milan Mental Hospital between 1862 and 1865. Ten years later, he published a study on *Pathology of the Sympathetic Nervous System* in which he stated that individuals reacted in different ways to the same stimulus according to the anatomical organization and distribution of the nervous system.<sup>26</sup>

Following this research line, he understood that the anatomical organization of the whole body, including the structural relationships between organs and apparatus, was the basic feature for understanding how individuals coped with diseases. Moreover, he understood that the anatomical organization of any individual was a moment in a continuum of development which needed to be entirely followed and appreciated to establish normal correlations and possible disharmonies causing or favouring pathological processes. In this way, clinical investigation found a new basis and a new method. The basis, both conceptual and material, was the "individual", that is, the specific morphology of the patient. The method was anthropometric, through which the clinician could measure the bodies of patients and correlate form and function, as well as any disharmony with possible diseases. Through this new basis and method, the clinician could study "heredity", "adaptation" and "anatomo-physiological correlations of the organs" in relationship with disease.<sup>27</sup> With "heredity", he understood the original make up which any individual acquired from his parents. With "adaptation", he understood any modification of the organism occurring in relationship with its environment and way of living. Modification which necessarily changed both the anatomy and the physiology of the organism and which could be at the origin of disease.

In his masterpiece, *La morfologia del corpo umano* (The Morphology of the Human Body), De Giovanni clarified the key elements of his constitutional medicine:

1. Anything that cause, in the individual, a morphological disharmony or an anomaly in the evolutionary process (ontogenesis), is or could be the source of morbidity.
2. The individual incessantly transform itself according to the principles of morphological and functional correlations and to that of adaptation to the environment. Therefore, it could be affected by different morbidities, in different moments of its life.

3. The principle according to which in the special morphology of the organism rules its special morbidity is valid in any moment of life.<sup>28</sup>

“Clinical anthropometry” was the method through which the “fundamental morphological moments which ruled individual morbidity” could be detected.<sup>29</sup> In other terms:

Any organized being is the sum of special apparatus which have specific morphological and physiological correlations among them. No one of these parts can modify without the others modify accordingly, because the functional correlation of the apparatus is the law maintaining organism's integrity. Relationships must exist among them, according to which from the knowledge of one part the others could be deduced. Known the degree of development of different parts in the body and established their relationships, the state of morphological harmony or disharmony can be detected, or, in other words, the individual constitution.<sup>30</sup>

For instance, the development of viscera was proportional, according to De Giovanni, to the development of their blood vessels and cavities inside the body. A disproportion among these structures could cause a disease or determine a predisposition to some diseases. Similarly, a bowel excessively developed could mechanically oppose respiratory and circulatory functions.

For individuating the “individual morphological type”, De Giovanni divided his clinical investigation in four moments: 1) measuring, 2) inspection, 3) anamnesis and 3) current state.<sup>31</sup> The measuring concerned the external part of the body and it was based on four fundamental measures: skeletal height, thoracic circumference, sternum height, abdomen height and bi-iliac diameter. The correlation between thoracic circumference and sternum height gave the measure of thoracic organs development, whereas the correlation between abdomen height and bi-iliac diameter gave the measure of viscera development. Inspection concerned the measure of internal organs (i.e. heart, portal veins and vena cava, liver, kidneys, intestines and so on) and apparatus (i.e. subcutaneous veins and fat, capillaries, lymphatic system and glans). Internal organs morphology was deduced through the individuation of external points corresponding to their hypothetic geometrical shape.

Note that at De Giovanni's time x-rays were just discovered and far from being introduced in clinical practice. The anthropometrical method was the only way to try to measure internal structures. By the way, for De Giovanni's morphological studies, Computed Tomography would have been more indicated than simple x-rays, exactly because the Italian clinician was focused on three-dimensional shape of single organs and on volumetric proportions among organs and apparatus.

In the same way that for the understanding of a “particular” the study of its “universal” is necessary, De Giovanni's study of individuality brought to the individuation of an “ideal type” of man, the measures of which represented the best correlation among forms and functions of the body and which represented the term

of comparison for analysing individuals' morphology (Fig. 1). Then, De Giovanni individuated three fundamental constitutional types, or "morphological combinations", any of which represented a different variation of the ideal type. Any of these types represented a specific morphological combination among bodily external and internal parts and apparatus. Therefore, any individual could be understood as a specific realization of one of these combinations that, representing three different "fundamental morphological moments which ruled individual morbidity", were crucial to diagnosis, prognosis and therapy. De Giovanni stressed that he decided to use the term morphological "combination", rather than "type", because this latter was related to the idea of something invariable, while individual constitution was continuously changing according to individual development and adaptation to environment.<sup>32</sup>

Briefly, the key characteristic of the first morphological combination was the prevalence of the transversal diameter, or wingspan, to the skeletal height (Fig. 2). This combination presented an underdeveloped thorax compared to the ideal type, correlated to underdeveloped lungs which, along with individual growth, determined a "hydraulic disequilibrium" between venous and arterial systems that could potentially affect different organs, such as heart, liver and kidneys.<sup>33</sup> De Giovanni advanced also that individuals belonging to the first combination were particularly predisposed to tuberculosis,<sup>34</sup> finding in the development of thorax and lungs the constitutional feature which could discriminate, among individual equally exposed to the bacteria, those who would have been affected.

The second morphological combination was characterized by an overdevelopment of the thorax correlated with a proportionate development of the heart and arterial system (Fig. 3).<sup>35</sup> The height of thorax exceeded the half of skeletal height. This combination was extremely rare in child, typical in young and adults. It predisposed to cardiovascular affections, in particular related to left ventricle and aorta.<sup>36</sup>

The third morphological combination, typical of the childhood, was characterized by a wide disproportion between thorax and abdomen with an overdevelopment of the visceral cavity (Fig. 4).<sup>37</sup> This combination was specifically characterized, quite obviously, by disorders in the gastrointestinal tract, including the lymphatic system, but also in the liver or in the spleen.

This description is only an oversimplification of De Giovanni's detailed analysis. It may be worth highlighting that any of these morphological combinations could be affected by any kind of disease in any part of the body, even if each one of them was specifically susceptible in different anatomical parts. Given whatever causative agent, constitutions were important because they typically influenced disease's beginning, course and resolution. In De Giovanni's words:

Morphological laws of organization, evolution and correlation rule not only the method of observation and experimentation, but also clinical investigation and reasoning.<sup>38</sup>

These laws, according to him, were fundamental for founding a clinic truly scientific because based on biological facts.



## Legacy

Constitutional medicine and De Giovanni's approach were completely forgotten after the second Global War. Clinical medicine definitely oriented on the scientific method of laboratory and the paradigms of bacteriology and cellular pathology. Rather than on macroscopic morphology, medicine focused its interest on the microanatomy of the human body, embracing the concept of "cell" as the fundamental morphological and physiological unit of the organism, as well as the fundamental seat of pathological processes. This orientation toward the microscopic features for the understanding of health and disease continues up to now. Molecular medicine studies the "anatomy of the human genome" basing of the concept that DNA is the "new Vesalian base for medicine in the 21<sup>st</sup> century".<sup>39</sup>

If De Giovanni based his attempt to scientifically found the concept of individuality through morphology and anthropometric measures, since the beginning of the 20<sup>th</sup> century medicine tried to find the marks of individuality and individual susceptibility in the chemical structures and processes of the human body. Anthropometric methods and morphology were substituted by chemistry, immunology and genetics. The Russian zoologist Ilya Ilyich Mechnikov (1845-1916) founded immunology on the theory of phagocytosis and advanced that immunity was acquired by a mechanism of struggle for life between leukocytes and bacteria.<sup>40</sup> The British physiologist Archibald Garrod (1857-1936), basing of his discovery on the inheritance of alkaptonuria, coined the term *Inborn errors of metabolism*<sup>41</sup> for describing genetic diseases involving congenital disorders of metabolism. Any person was characterized, according to Garrod, by a *chemical individuality* which could be the base of liability to disease.<sup>42</sup> De Giovanni recognized the role of heredity in the transmission of predispositions to disease from parents to child,<sup>43</sup> but genetics at his time was still rudimental. Only since the chromosomic theory was definitively introduced in 1915, genes were recognized as the fundamental units of heredity.<sup>44</sup>

Other than for its intrinsic obsolescence, De Giovanni's approach was literally forgotten for the instrumental use of the concept of bodily constitution made by some physicians in relationship with racial typology. Racial ideas were common in Europe since the modern period and they were gradually reinforced by anthropology and medicine during the second half of the nineteenth century. Even in De Giovanni's work this kind of ideas can be found. For instance, describing the first morphological combination, he stated that:

Between the wingspan and the skeletal height there is a constant proportion: it is proportionally greater in apes than in man – and greater in negros, negritos and papuas than in Caucasian races. Wingspan of wealthy classes is almost constantly greater than that of middle class and that of poor is almost constantly lesser than that of this latter.<sup>45</sup>

The First World War had a deep impact also in medicine and science, which were involved in nationalisms and used to justify the opposition between different countries with arguments based on qualitative differences among races. Sigmund

Freud (1856-1939), in his *Thoughts for the Times on War and Death* written in 1915, six months after the outbreak of World War I, stated that

The anthropologist tries to demonstrate that the enemy belongs to an inferior and degenerate race; psychiatry discovers in the same psychic and intellectual disorders.<sup>46</sup>

Constitutional studies were demonstrating that any human body reacted in a specific and unique way in front of diseases and that, therefore, bodily inequality was a universal phenomenon. This inequality could be easily transferred from a medical to a racial domain, and used to justify inequality between cultures and populations. A racial inequality which was already well proven by observations and researches in differential susceptibility to diseases of populations accompanying each step of European colonial expansion. Constitutional studies based on heredity and evolutionary ideas were important factors of the scientific racism which played a significant role in justifying eugenics and racial policies in different Western countries. Among them, German Nazism and Italian Fascism carried out the worst consequences, but eugenics programs were discussed, advocated or established in several other countries, such as Great Britain and United States.<sup>47</sup> In this latter country, immigration fuelled early interest in eugenics, where the *Immigration Restriction League* was founded in 1894 to bar what it considered inferior races from entering America and diluting what it saw as the superior American racial stock.<sup>48</sup>

During the First World War, many Italian physicians used evolutionary ideas to describe the German enemy as a population generally affected by a mental regression or degeneration. German people were closer to “barbarians” rather than civilized populations, and their culture manifested archaic characteristics such as aggression and subjugation.<sup>49</sup> During the Fascism, constitutional medicine assumed the role of “Italic medicine”, a medicine born and developed in Italy, of which the country owned the leadership.<sup>50</sup> Pupils of Achille De Giovanni were Giacinto Viola (1870-1943) and Nicola Pende (1880-1970). Viola introduced new statistical methods of measurement, while Pende introduced the analysis of endocrine system such as the dominant element in determining and characterizing different human constitutions (he coined the term “endocrinology”). Pende’s “biotypologic theory” was based on the integrate analysis of morphological, humoral and psychological characteristics of the individual. According to him, “there are not local diseases except in appearance, and every disease is always a general disease”.<sup>51</sup> In his *Bonifica umana razionale* (Rational Human Reclamation), dedicated to Benito Mussolini (1883-1945), Pende supported that his constitutional method, by which it was possible to evaluate psychical and physical characteristics of individuals, could be used in four main areas: 1) to rationalize the exploitation of individual abilities in employment; 2) to analyse and guide, since the infancy, the harmonic development of individuals; 3) to favour women’s prolificity; and 4) to establish a racial politics informed on peculiarities of different Italian ethnic groups.<sup>52</sup> He developed and supported a racist theory according to which Italian race could not mate with Africans and Jewish, otherwise its genetic constitution would degenerate. He became one of the favourite scientists of

Mussolini, who in 1938 supported his project to establish in Rome the *Istituto per la bonifica umana e l'ortogenesi della razza* (Institute of the Human Reclamation and the Orthogenesis of Race) for eugenic and racist researches, even if the Institute was never accomplished.<sup>53</sup> Finally, in 1938 Pende was among those who signed the *Manifesto degli scienziati razzisti* (Manifesto of the Racial Scientists).

In Germany, we can mention Alfred Ploetz (1860-1940), Otmar Freiherr von Verschuer (1896-1969), and Ernst Rüdin (1874-1952) who, basing on constitutional and evolutionary ideas, other than doing researches on the inheritance of diseases, advocated racial hygiene and compulsory sterilization programs in the first half of the Twentieth century.<sup>54</sup> Ploetz coined the term racial hygiene (Rassenhygiene), believed in the superiority of the Nordic race and his writings were a major influence on Nazi ideology. Verschuer used research material obtained in the Auschwitz camp, mainly through his former student Josef Mengele (1911-1979), who served there as a camp physician. With his friend Ploetz, Rüdin was among the founder of the *German Society for Racial Hygiene* in 1905 and strongly supported the voluntary or compulsory sterilization of psychiatric patients. In 1933, Rüdin, Ploetz, and other experts on racial hygiene were brought together to form the *Expert Committee on Questions of Population and Racial Policy*. The committee's ideas were used as a scientific basis to justify the racial policy of Nazi Germany and its *Law for the Prevention of Hereditarily Diseased Offspring* was passed by the German government on January 1, 1934.<sup>55</sup>

The horror caused by Nazi and Fascist genocide against the Jewish people and the fact that medical theories based on distorted concepts of constitution, heredity and evolution contributed to the justification of these policies, decisively contributed a sudden and complete decline of constitutional approach in the post-war medicine.<sup>56</sup>

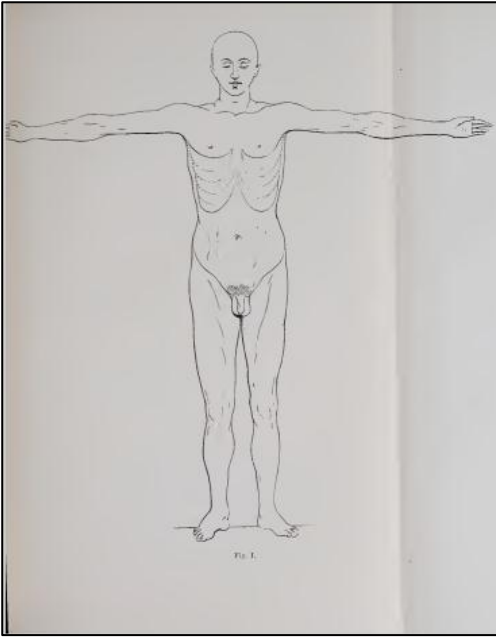
**Illustrations:**

Figure 1: The ideal “morphological combination” illustrated in A. De Giovanni, *Morfologia del corpo umano* (1891), 340.

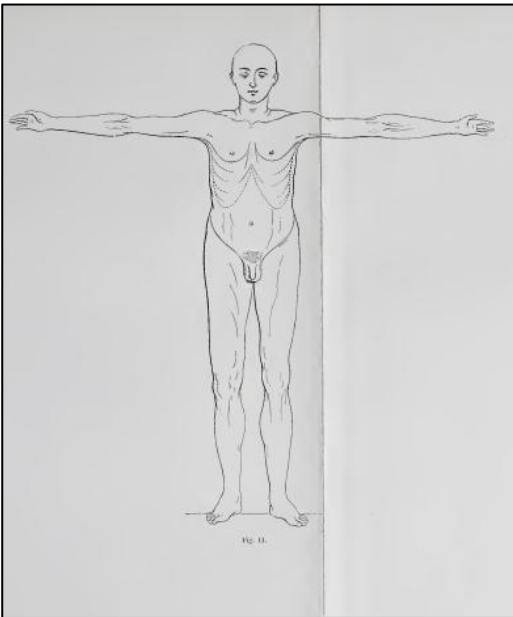


Figure 2: First “morphological combination” illustrated in A. De Giovanni, *Morfologia del corpo umano* (1891), 340.

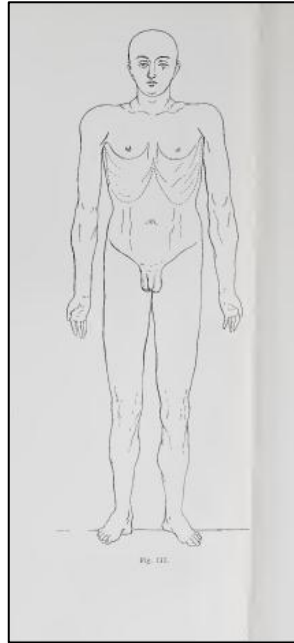


Figure 3: Second “morphological combination” illustrated in A. De Giovanni, *Morfologia del corpo umano* (1891), 340.

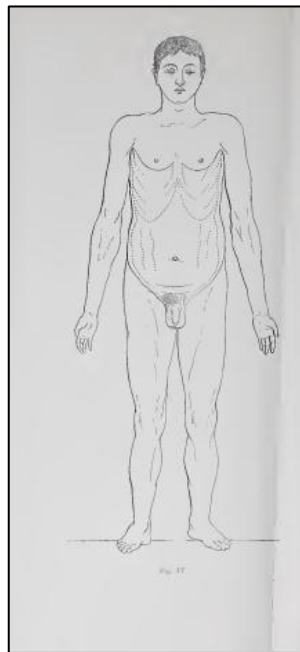


Figure 4: Third “morphological combination” illustrated in A. De Giovanni, *Morfologia del corpo umano* (1891), 340.

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