Review Article

J Babol Univ Med Sci
Vol 18, Issu 7; Jul 2016. P:24-33

Role of Anthropometric Dimensions of Human Body in Identifying Temperament in Traditional Persian Medicine

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J Babol Univ Med Sci; 18(7); Jul 2016; PP: 24-33

Received: Feb 14th 2016, Revised: Mar 2th 2016, Accepted: Jun 1th 2016

ABSTRACT

BACKGROUND AND OBJECTIVE: From the viewpoint of Traditional Persian Medicine (TPM), temperament of each person influences his physical and physiological properties such as body dimensions. The aim of this study is to review the reasons behind the diversity of human anthropometric measurements and their status in identifying temperament of people.

METHODS: In this descriptive study, we searched online databases such as Sid.ir, PubMed, Scopus, Magiran.com and Google Scholar for Persian key words such as "Anthropometry", "ergonomics" and "temperament" and their English equivalent. Authentic TPM books such as "The Canon of Medicine" by Avicenna, "Complete Book of the Medical Art" by al-Majusi, "al-Mansouri fi al-Tibb" (The book on medicine dedicated to al-Mansur) by Zakariya al-Razi, " Kholasa't ol Hikma" (summary of wisdom) by Aghili Khorasani, "Zakhireh kharazmshahi"(The treasure of Kharazm Shah) by Ismail Jurjani and "Bahr al-jawahir" (sea jewels) were also studied.

FINDINGS: Results of the study demonstrated that there is a direct relationship between weight gain, BMI and dimensions of soft tissue which are primarily signs of obesity and fat gain and cardiovascular diseases and diabetes. Since increase in the aforementioned indices can be a sign of coldness and wetness of temperament, one can argue that people with cold and wet temperament are more susceptible to such diseases. In references of TPM, temperament is mentioned as an agent that changes body dimensions and among the indices that identify temperament, "shape of organs" and "physique" is related to anatomic dimensions of body and obesity and thinness condition, receptively. Magnitude of chest and other organs is a sign of hotness; thinness is a sign of dryness; dominance of muscle tissue is a sign of hotness and wetness and dominance of adipose tissue is a sign of coldness and wetness of temperament.

CONCLUSION: According to the results of the present study, variety of anthropometric dimensions is related to genetic loci. Proving the hypothesis of relationship between anthropometric dimensions and temperament and relationship between temperament and genetic polymorphism in TPM requires more research. If the mentioned relationship is confirmed, the process of accessing standard tools for identifying temperament will be facilitated.

KEY WORDS: *Anthropometric, Ergonomics, Temperament, Traditional Medicine*.

Please cite this article as follows:

Vahedi A, Zamani M, Mojahedi M, Mozaffarpur SA, Saghebi R, Mououdi MA. Role of Anthropometric Dimensions of Human Body in Identifying Temperament in Traditional Persian Medicine. J Babol Univ Med Sci. 2016;18(7):24-33.

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[DOR: 20.1001.1.15614107.1395.18.7.4.0]
[DOI: 10.22088/jbums.18.7.24]

Introduction

Anthropometry, a subdivision of anthropology, measures dimensions and diameters of human body as a branch of anatomy science (1, 2). Although the main application of this science is in designing sites and equipments for humans, some standardized indices of this field such as thigh circumference, waist circumference and body mass index (BMI) are applicable in medicine. Most of the studies in this field are associated with identifying the relationship between anthropometric indices and occurrence or absence of some diseases (3-6).

Like many medical schools of ancient civilizations, Traditional Persian Medicine (TPM) has placed the basis of its health and illness diagnosis and health protection guidelines on individualized differences. This school of medicine has categorized the physical and mental differences in the human in the form of the keyword "Temperament" (called “Mizaj” in Persian language and TPM), investigated and presented its variations carefully (7, 8). From the viewpoint of TPM, temperament is the result of interaction between body organs; it is not identical in any two people in the world, so any member of human society has a unique temperament (9). TPM scholars have used different indices to identify temperament. Avicenna, the prominent Iranian physician, has categorized the indices that identify temperament into ten groups and explained their role in identifying temperament in full detail (10).

Among the ten aforementioned indices, two indices of "shape of organs" and "physique” (general appearance of the body) pertain to body dimensions. The purpose of this study is to investigate recent researches about the reason of diversity in anthropometric dimensions of different races and particularly members of one race as well as summarizing the opinions of TPM scholars about application of anthropometric dimensions in identifying temperament. If there is a probable relationship between varieties of anthropometric dimensions and differences in temperament, the process of explaining physiologic basics of temperament in TPM will be facilitated.

Methods

In this descriptive study, we searched online databases such as Sid.ir, PubMed, Scopus, Magiran.com and Google Scholar for Persian key words such as "Anthropometry", "ergonomics" and "temperament" and their English equivalent. Authentic TPM references such as "The Canon of Medicine" by Avicenna, "Complete Book of the Medical Art" by al-Majusi, "al-Mansouri fi al-Tibb" (The book on medicine dedicated to al-Mansur) by Zakariya al-Razi, "Kholasa't ol Hikma" (summary of wisdom) by Aghili Khorasani, "Zakhireh kharazmshahi"(The treasure of Kharazm Shah) by Ismail Jurjani and "Bahr al-jawahir" (sea jewels) were also studied.

Results

After investigating authentic databases, 54 articles and 8 books were ultimately used in the study.

A. Variety of anthropometric indices among different races: Science of ergonomics has elicited and standardized various indices to measure anthropometric dimensions. For instance, indices of height, weight, sole length, shoulder width, chest width, waist-to-hip ratio (WHR) and thigh circumference are the most commonly used anthropometric indices. Studies have demonstrated that anthropometric indices are diverse among different ethnic groups and races.

In other words, no two people in this world are alike, not even identical twins (11). Results of various studies in different countries show that length of organs is diverse among people (12, 13). In the study of Sanli et al. on 155 adult Turkish men and women, mean sole length, palm length and height of men was reported more than women (14). In Iran, study of Meshkdanian et al. on 300 Qazvin (an Iranian city) natives demonstrated that mean upper limb length, arm length, forearm length, hand length and hand width of men is more than women (15). In the aforementioned study, a comparison with the study of Holliday et al. revealed that mean forearm length of Qazvini men was more than Pakistani and Hindi men and the same index in Qazvini women was more than Pakistani and German women (15, 16).

Joneidi et al. have investigated 36 anthropometric indices among 6 Iranian ethnic groups in their study and reported significant differences in some indices; anthropometric indices of each ethnic group have been reported as a range of numbers (table 1) (17). Results of different studies suggest that ethnicity and inheritance can influence face shapes of people (18-21). Findings of Jahanshahi et al. in the north of Iran have demonstrated that women's face is generally

[DOR: 20.1001.1.15614107.1395.18.7.4.0]
[DOI: 10.22088/jbums.18.7.24]

Euryprosopic and men's face is generally Mesoprosopic among Fars and Turkmen races (19). In the study of Ghosh et al. on Santhal tribe in India, it has been found that women's face is generally Hypereuryprosopic and men's face is generally Euryprosopic (22). Body mass index (BMI) is different among people in European countries, American ethnic groups and various races in Asian and African countries (23-27). Although all measurements of anthropometric indices are reported as a range of numbers, no detailed study has been found to report difference in anthropometric indices of people in a particular race to the extent of results of this research.

Table 1. Anthropometric dimensions of some Iranian Turk male workers (cm) (17)

Variable	Mean±SD	5th percentile	95thpercentile
Height	169±10	153	185
Length of knee/hip	57±3	53	62
Shoulder width	44±4	38	50
Chest depth	23±3	20	28
Upper limb length	78±7	68	88
Hand width	8±1	7	9
Shoulder length	34±3	28	39
Hip width	40±3	35	45

B. Factors that cause variety in anthropometric dimensions: Study of Pietiläinen et al. and Silventoinen et al. have demonstrated that genetics and environmental factors can influence changes in body dimensions from childhood to early adulthood (28, 29). Study of Slemenda et al. has demonstrated that various patterns of ossification can be inherited and genetic factors can influence familial resemblance of bone mass in the entire skeletal system and in all ages (30). On the other hand, it was observed that inheritance and genetics plays a role in obesity of children and adults. For instance, study of Ochoa et al. demonstrated that synergistic interaction between PPARγ2 and ADRβ3 genes increases obesity risk up to 20 times in children and adolescents that carry variants of these two genes (31).

Scuteri et al. have shown that variants of FTO and PFKP genes are associated with increase in BMI, hip circumference and weight of carriers (32). Herbet et al. have also indicated that genetic variants near INSIG2 gene are associated with obesity (33). Soranzo et al. have indicated in their study that 17 gene loci are associated with height and CATSPER4 and TMED10 are the major relevant loci among them. GPR126, LCORL and PRKG2 are associated with body length, hip axis length (HAL) and thigh length, respectively. Nucleotide differences in these loci cause differences in skeletal dimensions among people (34). In a study of 146 20-83 years old men, Need et al. have found that presence of polymorphism in vitamin D receptor (VDR) gene is the factor that causes diversity in bone density and bone dimensions among men. People with BB genotype are likely to have bigger bone dimensions than other people (35).

Results of various studies demonstrate that diversity in nutrition and activities of individuals can influence their anthropometric indices such as height, weight and BMI (36-38). Studies of Elshibly et al. have demonstrated that there is a significant relationship between maternal lean body mass and weight, height and circumference of baby. Moreover, it has been observed that delivery order and mother's height are associated with risk of low birthweight and these two parameters have inverse relationship with the risk of underweight (39, 40).

C. Application of anthropometric indices: Anthropometry, as a major branch of ergonomics, plays a key role in advancing the goals of ergonomics by studying body dimensions and helping them to adapt to work tools and equipments (41, 42). Although the main application of anthropometry is in designing sites and equipments, some standardized indices of this field such as thigh circumference, waist circumference and body mass index (BMI) are applicable in medicine to detect physiological differences and their relationship with illnesses. Previous studies have demonstrated that there is a relationship between general power of organs and body and some of the anthropometric indices (43-45).

Study of Martin et al. have shown that there is a direct relationship between hand grip strength and volume of forearm muscles and upper arm muscle (46). Various studies have indicated that anthropometric indices such as height and weight can affect menstruation (47-49). In a study of Qaravi et al. on 100 female university students in Gorgan, Iran, it was found that there is a significant direct relationship between girls' height and age of first menstruation (50). Regarding cardiovascular diseases, findings of Heitmann et al. have demonstrated that smaller thighs mean greater risk of cardiovascular diseases (3). Moreover, findings of Debette et al. and Kim et al. have demonstrated that reduction in the size of calf is associated with greater risk of cardiovascular diseases

[DOR: 20.1001.1.15614107.1395.18.7.4.0]
[DOI: 10.22088/jbums.18.7.24]

(4, 5). Findings of Li et al. and Chuang et al. have demonstrated that index of wrist circumference is more associated with type 2 diabetes than other indices (51, 52). Nowadays in many developed countries, anthropometric indices are used in different surgeries such as plastic surgery, oral and maxillofacial surgery and brain surgery (53-55).

In a study of 400 native boys and girls of Esfahan, Alavi et al. have shown that anthropometric dimensions of skull and face among people of Esfahan is different from the same indices among people of Canada and difference in anthropometric dimensions in various races requires normal anthropometric index that is appropriate for that race in surgeries and tools for everyday life (56).

D. Reasons of variety in anthropometric indices and their application in traditional medicine: TPM has categorized the physical and mental differences of members of human societies in the form of the keyword "Temperament" and has studied its changes. From the viewpoint of this school, temperament is the result of interaction between body organs; it is not identical in any two people in the world and any member of human society has a unique temperament (57-59). This temperament diversity is evaluated in the form of two different ranges of quality: hotness and coldness, and dryness and wetness (10,60). In fact, temperament is a consequent of four qualities (hotness, coldness, dryness and wetness) of different components of a compound like human body (9,10, 60-62).

1. Status of temperament in TPM: Most healthcare directives of this school, which are presented under the title "Health Protection Measures", are set based on people's temperament and each healthcare directive is different from one person to another based on the type of temperament. On the other hand, illness diagnosis and treatment are done according to the type of temperament. One the important principles of prescribing medicine in this school is careful consideration of temperament of patient, temperament of patient's organs, temperament of the type of illness and finally temperament of the drug (58, 63).

Resources of this study have indicated that each person comes to this world based on a specific model of temperament. Avicenna has proposed temperament modification in principle of vigor and stated that the primary temperament of each person can change as people get older and their eating habits and other occupational and personal habits change (10). Resources of this study have categorized temperament into nine groups with details: hot, cold, wet, dry, hot and wet, hot and dry, cold and wet, cold and dry and moderate (10).

On the other hand, temperament influences physical, mental and physiological characteristics. Hence, in order to identify a person's temperament and their status in one of the nine groups it is necessary to examine all the related indices to identify their temperament (9, 10, 60-62).

2. Indices that identify temperament: Since many mental and physical indices need to be considered to identify temperament, Avicenna categorized these indices into ten groups under the title "ten materials" as follows: 1. Body sense. 2. Obesity and thinness (physique) 3. Hair. 4. Skin color. 5. Body dimensions (shape of organs). 6. Impressionability speed. 7. Sleep-wake states. 8. Actions. 9. Condition of fecal material. 10. Mental interactions (10). Of the aforementioned indices, shape of organs and physique were the focus of this study.

2.1 Shape of organs: Shape refers to form and figure of a thing (64). From the viewpoint of Avicenna, size of organs, joints and chest represents the general shape of organs. Magnitude of organs is a sign of hotness and smallness of organs indicates coldness of temperament. Hot temperament causes magnitude of chest and organs, width and salience of superficial veins and magnitude of muscles and their proximity to joints; such indices are rarely observed in people with cold temperament (10). Jurjani sees wide chest and large veins as signs of hotness and lack of these characteristics as coldness and the median condition as a sign of moderation (9).

Ahwazi considers strength of organs as a sign of hot temperament and magnitude of chest (particularly along with smallness of head) a sign of hot heart and considers the opposite symptoms as a sign of coldness of heart temperament (60). Razi notes this index as one the main indices that identify temperament and mentions magnitude of nostrils and ducts in people with hot temperament and mentions narrowness and thinness of them in people with cold temperament. He mentions lack of salience of joints as a sign of wet temperament, salience of joints as a sign of dry temperament and salience of tendons, bones and joints as a sign of hot and dry temperament. He sees salient larynx, long neck and long nose as signs of cold temperament and magnitude and salience of eyes, width of nose, beef cheek, little facial hair and thin

[DOR: 20.1001.1.15614107.1395.18.7.4.0]
[DOI: 10.22088/jbums.18.7.24]

nails as signs of wet temperament. He also sees shortness and thickness of fingers as a sign of coldness and wetness of temperament, respectively (61).

2.2 Physique: In TPM, physique refers to obesity and thinness status and weakness and stiffness of adipose tissue and muscles and divides people into three groups: fat people, thin people and moderate people (62). Increase in adipose tissue and muscles compared with the average level of community is a sign of wetness, decrease in adipose tissue is a sign of dryness and a moderate status between obesity and thinness is a sign of moderate temperament. A fat body with dominance of adipose is a sign of coldness and wetness, a muscular body is a sign of hotness and wetness and thinness is usually a sign of dryness and is not an indicator of hotness or coldness alone. Nevertheless, cold and dry people are usually thinner than hot and dry people; although hot and dry people are thin, they have an acceptable muscular tissue, while cold and dry people lack a notable muscular tissue (table 2) (58, 60).

Table 2. Shape of organs and physique as two indices to define temperament in Iranian traditional resources

Index	Wetness	Dryness	Hotness	Coldness
Physique	Dominance of adipose or muscle	Thinness	Dominance of muscle over adipose	Dominance of adipose/Extreme thinness
Shape of organs	Softness of organs (in movements)	Long neck	Magnitude of chest	Smallness of chest
	Lack of salience of joints	Salience of joints	Magnitude of hands and legs	Smallness of hands and legs
	Lack of salience of laryngeal cartilage	Salience of laryngeal cartilage	Magnitude of muscles	Smallness of muscles
	Wide nose	Thin and long nose		Shortness of fingers
	Magnitude and salience of eyes			
	Beef cheek			
	Thickness of fingers			

Discussion

According to the results of this study, diversity of anthropometric dimensions exists among various races and also the people of one race. Although no study has been reported to investigate the differences among people of one race, diversity of anthropometric dimensions among homogeneous people has lead to reportage of a range of anthropometric indices in homogeneous people of one race. Since TPM, based on the basic principle of temperament, has special attention to physical and biological differences of humans and uses them to diagnose and treat diseases and suggest health care directives, having access to practical methods of identifying temperament can help health promotion in society.

According to the fact that two practical indices of identifying temperament-shape of organs and physique-refer to anthropometric dimensions and characteristics of human body based on theoretical principles of traditional medicine, if the relationship between these dimensions and temperament of people is proved in future studies, it is possible to convert one of the qualitative indices of identifying temperament to a quantitative index by measuring the aforementioned dimensions. Based on the results of this study, there is a direct relationship between weight gain, BMI and dimensions of soft tissue which are primarily signs of obesity and fat gain and cardiovascular diseases and diabetes. Since increase in the aforementioned indices can be a sign of coldness and wetness of temperament, one can argue that people with cold and wet temperament are more susceptible to such diseases. Moreover, since the risk of such diseases among thin people is lower than fat people and thinness is a sign of wet temperament, one can propose a hypothesis to assert that people with wet temperament are less susceptible to these diseases.

It is suggested that the relationship between people's temperament and susceptibility to disease be investigated in future studies. Furthermore, according to the results of this study, majority of the studies regarding relationship between diseases and anthropometric dimensions have investigated the relationship between soft tissue and aforementioned diseases and not many detailed and adequate studies have been conducted to investigate the relationship between osseous dimensions of body and various

[DOR: 20.1001.1.15614107.1395.18.7.4.0]
[DOI: 10.22088/jbums.18.7.24]

diseases. Hence, it is suggested that more attention be paid to such issues in future studies. Since body dimension is one the indices that identifies temperament in TPM, any factor that influences these dimensions is theoretically a factor that can change people's temperament.

According to the fact that genetic differences of people can play a key role in diversity of their anthropometric indices, one can hypothesize that temperament in TPM might be closely related to some genetic properties. Based on this hypothesis one can argue that genes such as FTO and PFKP which cause obesity, act more effectively among people with cold and wet temperament. In other words, there may be a significant relationship between genetic polymorphism and temperament variety.

Based on the same hypothesis, one can expect to find a significant relationship between polymorphism of ossification loci (such as PRKG2, GPR126 and LCORL), which increases osseous dimensions, and hot temperament in TPM. To prove these hypotheses, having access to standard tools for identifying temperament of people and studying genetic differences of these people is necessary. It is suggested that the relationship between different anthropometric indices of traditional medicine and various temperaments be investigated in future studies. If the aforementioned relationship is proven and proper cutoff points are extracted for related anthropometric indices, it will be a huge step forward in quantifying qualitative indices of identifying temperament and the process of accessing genetic basics of temperament will be accelerated. If these cases are studied in ergonomics science, a new approach is formed that offers anthropometric dimensions of each society based on temperamental differences of people and identifies workplace requirements, personal tools and equipments, and environmental conditions of workplace and living place.

Acknowledgments

Hereby, we would like to thank the authorities and colleagues in Faculty of Traditional Medicine of Babol University of Medical Sciences for their unsparing cooperation.

[DOR: 20.1001.1.15614107.1395.18.7.4.0]
[DOI: 10.22088/jbums.18.7.24]

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