

A comparative study of skin roughness and smoothness in females of different temperaments by self designed frictiometer

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Abstract: Temperament plays very important role in diagnosis and treatment of disease in Unani system of medicine. It believes that human being can be categorized into four groups according to temperament in the state of health. Various signs are described for diagnosis of temperament in the literature of this system of medicine. Touch of the skin is one among these signs which includes skin roughness and smoothness along with other characters. Skin friction coefficient is considered as a method for quantitative measurement of skin roughness and smoothness. Skin friction coefficients of healthy females of two temperaments- Choleric and Phlegmatic were recorded by self designed module named as frictiometer based on principle of Wheatstone bridge. The obtained data were analyzed by t test. Study has revealed that skin friction coefficient of choleric temperament females was higher than females of phlegmatic temperament.

Key words: friction coefficient, frictiometer, human skin, temperament.

Introduction

On the basis of temperament human can be classified into four groups in the state of health. Skin touch is a diagnostic sign for determination of temperament^[1, 2, 3]. This system of medicine mentions that human could be divided by properties of their skin (also known as malmas) such as; hotness and coldness, dryness and moistness, roughness and smoothness, hardness and softness & lightness and heaviness.^[4] It is also described that skin of dry temperament (Choleric and Melancholic) individuals is rougher than the skin of skin of moist temperament (Sanguine and Phlegmatic) individuals^[5,6]. But this classification relies solely on qualitative judgment skill of investigator Now a days friction coefficient of skin is most widely accepted method to measure roughness and smoothness of skin. Friction studies are useful in quantitatively investigating the skin surface as it has big discrimination ability of classification of human temperament therefore can be used in alternative oriental medicines^[7]. Comparative studies are particularly useful as it provides quantitative measurement to assess the skin. Friction studied can be conducted with non invasive method and it gives measure of skin health^[8]. Another category of studies investigated the role of skin friction, especially of the finger pad, in connection with the sense of touch^[9].

Investigation of skin frictional properties is relevant to several research areas, such as skin physiology, skin care products, textile industry, human friction-dependent activities and skin friction-induced injuries. Frictional properties of the skin surface may become an objective assessment of skin pathologies. It has been shown that frictional properties can reflect the chemical and physical properties of the skin surface.^[10]. In this paper skin friction coefficient is taken as a tool for determination of temperament thereby measuring skin roughness quantitatively. We present the method of assessment of skin friction coefficient and diagnostic standards of human temperament based on principals of Unani system of medicine.

Materials and Methods

The present study is an investigation in which researcher conducted the study to explore variability of skin friction coefficient among the persons of Choleric and Phlegmatic temperament. This study was carried out in the post graduate department of Kulliyat, Ajmal Khan Tibbiya College, Aligarh Muslim University, Aligarh during the year 2011-2013.

I. Sample

A random sampling method was adopted to collect the required data. For the present study, seventy eight (78) healthy female volunteers having Phlegmatic and Choleric temperaments in the age group of 18–25 years were randomly selected from Ajmal Khan Tibbiya College and some other faculties of Aligarh Muslim University and Aligarh city.

II. Exclusion Criteria

The persons doing heavy physical work and chemical exposure were excluded from the study.

Volunteers having history of burn, contracture, scar, major accident and surgery or taking steroids for long period were excluded from this study.

The volunteers, suffering from Malnutrition, or any systemic and local disease that influence skin characteristics, were excluded from the study.

For the selection of healthy volunteers, detailed clinical history, physical, general and local examinations were done.

III. Informed Consent

The research was presented to the Medical Ethics Committee of the faculty of Unani system of medicine, AMU, Aligarh. They indicated that this study does not require an official medical-ethics examination. Prior to the measurement programme the subject gave informed consent.

An informed consent form was administered by the researcher to the volunteers during study prior to their completing the other measurements. The purpose of the informed consent form was to obtain permission from each of the volunteers and their willingness to take part in this study. The form indicated exactly the study demands, what the volunteers expect from the study, the minimal risks and benefits of their participation, and guarantee of confidentiality. It had also stated the volunteer ability to withdraw from the study at any time without penalty and provide the researcher's contact information if concerns arise.

IV. Determination of Temperament

The assessment of the temperament of the volunteers was made on the basis of a performa (questionnaire) prepared in the light of criteria, described in classical Unani literature i.e. ten determinants. The Performa of the temperament was given in the tabulated form to the volunteers. After determination of the temperament, selected volunteers were divided into two groups according to their temperament.

Group A: Choleric

Group B: Phlegmatic

After categorization of volunteers, friction coefficient of skin was taken by self designed frictiometer.

V. Method of skin friction coefficient measurement

Skin Friction coefficient measurement was done by frictiometer attached with mutimeter (volt). Skin friction coefficient of lateral side on dorsum of hand was measured. The test subject for this study was healthy female volunteers, aged 21-25 years. Though the device can access the skin on many anatomical locations, in this study the skin of lateral side on dorsum of hand was chosen. The axis of rotation of the roller probe (frictional head) was perpendicular of hand length. The hand was put on the wooden base with the palm downward, in a relaxed position. A constant rotational speed was applied on to the skin by frictional head. Friction produced by the skin against the frictional head was recorded. Measurement was taken as volt displayed in multimeter. The skin sample was not treated or cleaned before the measurements. All measurements were carried out in a laboratory with controlled temperature and relative humidity. The subjects were required to enter in the laboratory at least 30 minutes before the test. During the test period they were asked to sit down and stay relaxed.

Typically, each measurement was repeated three times in order to ensure the reliability of the measurements. All the measurements were executed by the same researcher.

We have chosen skin of dorsum of hand because:

It is mentioned in classical Unani literature that the skin of hand is most equable as compare to skin of other part of body.^[11,12,13] The order of equability of skin of hand is: finger tips > remaining parts of finger > palm of hand > dorsum of hand.

Finger tips, palm of hand are more used in routine work and skin is thick. Dorsum of hand is least affected by any type of work.

VI. Principle of frictiometer

The prototype frictiometer is a basically a Wheatstone bridge where a resistance is replaced by a motor which is attached through DC cord to multimeter (volt) to make unit T 10ADCMAS830L, to stabilize the inflow of current. The equipment consists of a motor, a steering unit, a friction head and a voltmeter. A constant rotational speed is applied on to the skin by frictional head. Measurement was taken as volt displayed in voltmeter. The volt is then converted into coefficient of friction (μ) by using the calibrated table prepared for this purpose. The calibration table was prepared by measuring coefficient of friction (μ) for various materials against rubber head used in friction head. The friction coefficient then calculated from the corresponding voltage by following formula:

$$\mu_s = V_s \times \mu_m / V_m$$

- μ_s = skin friction coefficient
- V_s = corresponding voltage of skin
- μ_m = friction coefficient of material
- V_m = corresponding voltage of material

Table 1: Coefficient of various materials and their respective voltage

Material	Inclined angle (tan θ)	Coefficient of friction (μ_m)	Corresponding voltage (V_m)
Rubber vs Steel	17	.306	1.342
Rubber vs Rubber	20	.364	1.639
Rubber vs Glass	15	.268	1.291
Rubber vs Wood	25	.466	1.726



Fig 1. Frictiometer

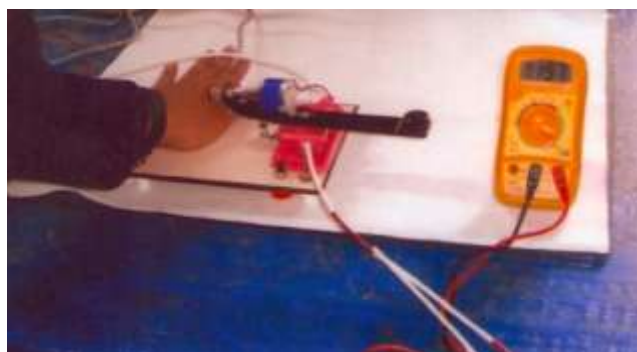


Fig 2. Method of assessment of skin friction coefficient

VII. Statistical procedure:

To make an inference of the present investigation, the researcher sequentially arranged the raw data into a tabular format and go through statistical analysis to know the mean and standard deviation followed by t-test to established skin friction coefficient variations between means of the Phlegmatic and Choleric temperaments scores.

RESULTS

Table-2 Indicating skin friction coefficient of volunteers expressed as Mean ± SD*

Temperament	Number of Volunteers	Mean	±	SD*
Choleric	52	0.373	±	0.081
Phlegmatic	13	0.279	±	0.096

*Standard Deviation

Present study revealed that the mean value of skin coefficient friction coefficient was high in Choleric and low in Phlegmatic individuals as shown in Table-02.

Table-03 Showing Comparison of skin friction coefficient between different temperaments

Temperament	Significance
Choleric vs Phlegmatic	p = .0005

Present study exhibited that the variability of skin friction coefficient between Choleric and Phlegmatic temperament individuals was extremely significant, as shown in Table-03.

Discussion

Skin friction coefficient was evaluated in Choleric and Phlegmatic temperaments; in this regard our analysis showed that Choleric temperament individuals possess high skin friction coefficient as compared to Phlegmatic which means they have more rough skin. Present study reveals that the result is in total conformity to Unani concept that roughness of skin indicates dry temperament (Choleric). Smoothness of skin denotes moist temperament (Phlegmatic). Additional data will be collected and used in future study, and reasons for differences between choleric and phlegmatic will be discussed in subsequent research.

Conclusion

From the finding of this study it is concluded that Choleric temperament individuals possess high skin friction coefficient as compared to Phlegmatic. Skin friction coefficient can be used as a tool for assessment of temperament. As it is a quantitative method, temperament can be determined more accurately by using it.

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