

# The Evaluation of basic and neurohormonal parameters in hot or cold temperament person proposed in Iranian Traditional Medicine: an observational study

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## Abstract

**Objective:** Much of energy for life sustainment is consumed as the basal metabolic rate (BMR). Temperament is one of the core concepts in Iranian Traditional Medicine. The aim of this study is to assess the BMR and activity of the sympathetic–parasympathetic nervous system and thyroid function in hot and cold temperament people. Our study is a repeated cross-sectional study which was implemented in 2 stages on 45 healthy volunteers.

**Methods:** BMR was evaluated by indirect calorimetry. Thyroid function, sympathetic–parasympathetic nervous system activity, body composition, and nutrition status were also evaluated. We used independent *t*-test for data analysis by SPSS ver. 16.

**Results:** Overall, 45 patients aged 18–40 participated in this study. Our results showed that the mean of BMRs were respectively 1664.09 and 1909.48 kcal in cold and hot temperament individuals ( $P<0.3$ ). Systolic and diastolic blood pressure, and heart rate peripheral temperature of individuals with hot temperament were significantly higher ( $P<0.05$ ), While no statistically significant difference was seen in norepinephrine to epinephrine ratio, norepinephrine to cortisol ratio and core temperature. T3 and TSH levels were respectively, 1.99 and 1.26 in cold temperament individuals and 1.38 and 1.40 in hot temperament individuals ( $P<0.05$ ).

**Conclusion:** It shows signs that there is a relationship between the BMR and neurohormonal system and body temperament meaning cold temperament people have lower BMR, sympathetic nervous system activity and thyroid function in comparison to others. Body health is negatively affected by BMR fluctuations. With regarding to this correspondence, the arrangement of a pattern for better BMR regulation is crucial.

**Keywords:** Temperament; Iranian Traditional Medicine; Basal Metabolic Rate; Sympathetic – Parasympathetic nervous System; Thyroid function

**Abbreviations:** Basal Metabolic Rate (BMR), Iranian Traditional Medicine (ITM), Thermic Effect of Food (TEF), Activity Thermogenesis (AT), Bioelectrical Impedance Analysis (BIA), Enzyme-Linked Immunosorbent Assay (ELISA).

## Introduction

The total energy consumed by human body consists of basal or resting metabolic rate (BMR), thermic effect of food (TEF), and activity thermogenesis (AT). BMR is the minimum amount of expended energy that is compatible with life and it is needed to sustain the metabolic activities of cells and tissues as well as to maintain the processes of circulatory, respiratory, gastrointestinal, and renal systems.<sup>1, 2</sup> BMR comprises approximately 60–70% of the total energy expenditure which is affected by several factors such as age, sex, body composition, size, heredity and molecular genetics, hormones, and environmental conditions.<sup>3–6</sup>

Some hormonal factors including the autonomous nervous system and thyroid hormones affect BMR. As one of the most important factors affecting BMR, sympathetic–parasympathetic nervous system is influenced by various factors such as age, sex, stress, psychological, and emotional status, etc. Moreover, the thyroid function modulates the BMR and following conditions such as cold and heat tolerance, fatigue, euphoria, heart rate, movement speed, etc.<sup>7</sup> According to the preceding issues, differences in BMR can be a result of diversities of factors affecting the

sympathetic–parasympathetic nervous system and thyroid function.<sup>8–17</sup>

Iranian Traditional Medicine (ITM, Persian medicine) is one of the oldest schools of traditional medicine.<sup>18–22</sup> From ITM point of view, temperament is one of the basic concepts of health and disease. Temperament is variable among individuals and is affected by several factors such as age, sex, environment, and body composition.<sup>23–26</sup>

Recent investigations have shown that hot (warm) and cold temperaments can be associated with BMR and similarly with sympathetic–parasympathetic nervous system activity.<sup>27, 28</sup> Some of these relationships are shown in Table 1.

According to the foregoing discussion, it seems that hot temperament people have a higher BMR in comparison to cold temperament people. A new window is hoped to be created in nutrition science and public health by development of BMR concept in traditional medicine viewpoint. In order to investigate this relationship, comparison between the BMR of both cold and hot temperament individuals was carried out.

## Materials and Methods

This is a descriptive–analytic study. Since the under investigation variables can be affected by different factors, all the variables were investigated in 2 stages with a 2–4 weeks interval.

In order to select individuals undergoing the study, a notification was published and distributed among the students residing in Tehran University of Medical Sciences dormitories.

## Inclusion Criteria

Age from 18 to 40 years, healthy individuals (according to history and physical examination), normal body mass index, informed consent.

## Exclusion Criteria

Use of any specific dietary pattern such as vegetarianism, smoking, alcohol imbibing, or regular consumption of coffee, Taking any medications or supplements in the past month,

abnormal biochemical lab test after evaluation, not having tendency to participate in the study.

In this study, demographic characteristics such as height, weight, vital signs, blood group, RH, BMR, body composition, and biochemical assays (measurement of serum levels of adrenaline, noradrenalin, cortisol, T3, T4, and TSH) were evaluated. Nutrient intake was assessed using a food frequency questionnaire and three 24-h dietary recalls.

Temperaments of participants were determined by a validated questionnaire<sup>29</sup> and the expert diagnosis (traditional medicine specialist). Based on the foresaid temperament determining questionnaire, if the total score of the individual was 19 or greater, he was hot temperament; and if it was 14 or less, the temperament was cold. If the score's range was from 15 to 18, the individual's temperament was considered mild that was excluded from the study. The number of gender-divided hot and cold temperament participants was based on required sample size.

BMR was measured by the use of indirect calorimetry (METALYZER 1B). In order to control the factors affecting metabolic rate, avoidance of any food especially coffee and cigarette 12 hours before the test was recommended to the participants. They should be also inhibited from moderate and severe aerobic or anaerobic activity 2 and 14 hours before the test, respectively. Before performing indirect calorimetry, the participants should rest for 10–20 min. During the test, the room temperature was maintained 20–25°C.<sup>30</sup> Participants' body composition, including weight, fat, water and muscle percentage, and fat-free mass were measured by Bioelectrical Impedance Analysis (BIA) (Company INBODY Model 770).

Serum thyroid function tests were measured using Enzyme-Linked Immunosorbent Assay (ELISA) and "PishtazTebcompany kits", epinephrine and norepinephrine using 2-CAT ELISA kit manufactured by Immunobiological Laboratories company, cortisol by DCMO23-4 kit by DiaMetra company, and blood group and RH by Cinnaclo II kit.

Calculations were performed using 80% power, a 5% significance level, and a 25% dropout rate. The required sample size was approximately 40 participants for each group allowing a 25% withdrawal rate.

Table 1. Factors affecting BMR & temperament.

Variable	Basal metabolic rate	Temperament
Age	*High in the first and second year of life *Reduces 2–3% in each decade of life <sup>1,2</sup>	*Hot temperament is more common in children and the young <sup>4</sup> *Temperament heat starts to decrease after the age of 35–40 <sup>5</sup>
sex	In the same weight and height, BMR in women, is 5–10% less than men <sup>1,2</sup>	Female temperament is colder than the male <sup>5</sup>
Body composition	*Muscle mass is the most significant determinant of BMR. *It increases BMR <sup>1,2</sup>	*High muscle mass indicate hot temperament *High fat mass indicates cold temperament <sup>4</sup>
Body surface	Those who have more body surface, have higher BMR <sup>1</sup>	*High muscle mass indicate hot temperament *High fat mass indicates cold temperament <sup>4</sup>
The sympathetic-parasympathetic nervous system	Stimulating the sympathetic nervous system (e.g. stress) raises the BMR <sup>1</sup>	Some emotional conditions can increase body's hot temperament <sup>6</sup>
Thyroid function	*Hypothyroidism reduces the BMR *Hyperthyroidism increases the BMR <sup>1,3</sup>	*Individuals with cold temperament feel cold more than others & tolerate heat better than the cold in normal conditions. *In hot temperament individuals, it is reversed <sup>4,6</sup>

We used SPSS (Statistical Package for Social Sciences, ver 16) program for Statistical analysis. Mean and standard deviation were calculated for quantitative variables and frequency (percent) describes qualitative variables. Independent *t*-test was used to compare BMR, thyroid function and body composition, nutrient intake, clinical characteristics, and biochemical tests between two groups. Less than  $P < 0.05$  was assumed as significance.

This study was approved by Tehran University of Medical Sciences ethics committee bearing code number 90-04-27-15366-55307. All subjects were informed through a written consent form.

## Results

Totally, 45 patients aged 18–40 years participated in this study. Two people were excluded because of not being able to complete the study. Finally, 43 patients terminated the study, 20 of whom were male (46.5%) and 23 were females (53.5%). Ten men had hot temperament and 10 had cold temperament. Among women, 11 had hot temperament and 12 had cold temperament.

The average age of the participants was  $27.47 \pm 4.65$  years that this average was more in cold temperament people, but no statistically significant difference existed between them ( $P$  value = 0.152). Hematocrit and hemoglobin levels were in the normal range in all participating subjects and no statistically significant differences existed among the two hot and cold temperament people (hot and cold groups) ( $P$  value  $> 0.05$ ). But the amounts of hemoglobin and hematocrit were significantly higher in men ( $P$  value  $< 0.05$ ).

The results of the anthropometric indices showed that weight, height, and body mass index had no significant diversity among the two groups ( $P$  value  $> 0.05$ ).

As shown in Table 2, body fat mass and percentage were significantly greater in the cold groups ( $P$  value  $< 0.05$ ) and the percentage of fat free mass and skeletal muscle mass was significantly higher in the hot group ( $P$  value  $< 0.05$ ). Although the amount and percentage of body water was more in cold group, this difference was not statistically significant ( $P$  value  $> 0.05$ ).

## Nutrient Intake Results

Based on FFQ, intake of energy (2572.2 vs 1900.61 kcal), carbohydrate (361.40 vs 253.24), fat (89.61 vs 70.08) and protein (94.33 vs 76.24 g) was significantly higher in the hot group ( $P$  value  $< 0.05$ ).

Based on the 24-h recall questionnaire, the individuals' food intake temperament was assessed relatively due to the expert idea in both days before intervention. Based on the results, no significant relationship existed among the two groups in any days before intervention ( $P$  value  $> 0.05$ ).

## Biochemical and Metabolic Findings

As shown in Table 3, the hot group has a significantly higher BMR ( $P$  value = 0.03) even after adjusting BMR for weight ( $P$  value = .006). T3 amounts were significantly higher in hot group and TSH was higher in cold group ( $P$  value  $< 0.05$ ). Although T4 rate was higher in hot group, it can't be considered meaningful ( $P$  value = 0.457).

As shown in Fig 1, heart rate, systolic and diastolic blood pressure, and peripheral temperature of the hot group was significantly higher ( $P$  value  $< 0.05$ ). But core temperature, the norepinephrine to epinephrine and norepinephrine to cortisol ratio were not significantly diverse among them ( $P$  value  $> 0.05$ ).

## Discussion

The results indicate that body composition of people with hot temperament significantly differs from people with cold temperament; So that fat tissue is more in cold group and the percentage of fat-free mass and skeletal muscle mass is more in hot group. These findings confirm the traditional medicine viewpoint about the temperament. According to this view, the temperament of fat tissue is cold and muscle tissue is hot. Accordingly, the amount of fat is higher in the body of cold group, while the amount of muscle is higher in the body of hot group. In conclusion, body composition can be used as a marker to identify individuals' temperaments.

Based on the findings of this study, no significant relationship was seen between the blood group or Rh and temperament which may be due to small sample size. For exact assessment of this relation and further studies, greater sample sizes are needed in this regard. Our results indicate that BMR varies in hot and cold group. Indeed, the mean BMR is higher in hot group. Even after weight adjusting (the metabolic rate per kilogram of body weight), the similar results were seen. Basal metabolism maintenance and preventing it from slowing down or rising up would affect human health. Although traditional concept of temperament is not adverted in modern medicine, investigation of factors influencing temperament indicates that it's possible

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Fig. 1 **The clinical characteristics and biochemical tests to measure the performance of the sympathetic-parasympathetic nervous system.**

Table 2. **Body composition of participants based on temperament.**

Variable	Temperament of individuals				Significance statistical test*P value
	Cold temperament n=22		Hot temperament n=21		
	Mean	Standard deviation	Mean	Standard deviation	
Body fat mass(kg)	13.41	2.15	18.35	4.15	.001>
Body fat percentage	21.73	5.47	27.98	7.37	.003
Skeletal muscle mass (kg)	30.99	7.15	27.03	5.48	.047
Fate free mass percentage	78.49	5.72	72.02	7.37	.003
Body water (Lt)	36.14	8.34	37.41	6.47	.579
Body water percentage	55.70	6.23	56.11	462	.807

Independent t-test\*

Table 3. **BMR and T3, T4, TSH levels based on temperament.**

Variable	Temperament of individuals				Significance statistical test*P value
	Cold temperament n=22		Hot temperament n=21		
	Mean	SD	Mean	SD	
Basal metabolic rate/Kgbw(kcal)	25.74	2.96	28.76	3.88	.006
Basal metabolic rate(kcal)	1664.09	252.04	1909.48	442.40	.030
T3	1.26	.13	1.40	.18	.008
T4	7.19	.48	7.29	.34	.457
TSH	1.99	1.24	1.38	.63	.049

to consider these effective factors for BMR regulation. In ITM, many health protecting orders and diagnostic and therapeutic procedures are determined based on the temperament of individuals. Temperament of each individual is based on several physical and psychological characteristics which are completely introduced in ITM sources. Temperament detecting templates have diagnostic roles in determining the temperament. Based on ITM view, different reactions to pathogenic conditions can be explained by temperament consideration so new abilities may be built to forecast diseases related to temperament susceptibility and to improve treatments on the basis of food and drug temperament. Regarding the differences between nutrient intake of hot and cold group, according to the results of our study, it seems that hot group by virtue of having a higher BMR and more muscle tissue, has a greater need for energy and as a result, total calorie and following different macronutrients intake is higher in them. In order to prove the relation between the sympathetic-parasympathetic nervous system and temperament, the clinical indices and vital signs were also measured in addition to plasma epinephrine, norepinephrine, and cortisol level which were assessed in Shahabi et al. study. Epinephrine and norepinephrine are indices for assessing the balance between environmental sympathetic nervous system and adrenal sympathetic while norepinephrine to cortisol ratio is an index of balance between environmental sympathetic and parasympathetic activity.

Clinical indices include heart rate, systolic blood pressure, diastolic blood pressure, core temperature, and the ambient temperature. Based on the results of this study, the norepinephrine to epinephrine ratio and norepinephrine to cortisol ratio is not significantly different between hot and cold groups.

The differences between results of this study and the study of Shahabi et al may be due to the difference in the time of measurement. Our sampling was carried out early in the morning and in the fasting state while in the study of Shahabi et al, the sampling was implemented at 3–5 PM. As so many factors are effective in the balance of the sympathetic-parasympathetic system, more appropriate indicators may be needed to measure this amount.

The clinical parameters and vital signs of the individuals were meaningfully different in two groups. The results of this study showed that heart rate, systolic blood pressure, diastolic blood pressure, and ambient temperature were significantly higher in hot group verifying more sympathetic activity in the hot temperament and more parasympathetic activity in cold temperament. Similarly symptoms of hypothyroidism in cold temperament and hyperthyroidism signs in hot temperament suggest their relationship with each other in the mind. The results of our study confirm this hypothesis and show that there is a direct correlation between temperament and the level of thyroid function.

## Conclusion

It seems that there is a relationship between the BMR and neurohormonal system and body temperament meaning hot temperament people have higher BMR, sympathetic nervous system activity, and thyroid function in comparison to others. Human health is negatively affected by BMR fluctuations. Regarding this correspondence, arrangement of a pattern for better BMR regulation is crucial.

Obviously, more studies are needed in order to make the two schools of medicine closer to each other in their path stepping forward health maintenance and disease control.

Furthermore, coldness of temperament may cause fat accumulation in body. This may probably imply that body fat mass is decreased by temperament heating.

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## Conflict of interest disclosure:

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## References:

- McMurray RG, Soares J, Caspersen CJ, McCurdy T. Examining variations of resting metabolic rate of adults: a public health perspective. *Med Sci Sports Exercise*. 2014;46(7):1352.
- Manini TM. Energy expenditure and aging. *Ageing research reviews*. 2010;9(1):1-11.
- Carol D, Rachel K, Mahan L, Escott Stump S. *Krause's food & nutrition therapy 12e*. Canada: Saunders El-Sevier; 2008.
- White CR, Kearney MR. Determinants of inter-specific variation in basal metabolic rate. *J Comp Physiol B*. 2013;183(1):1-26.
- Swanson DL, McKechnie AE, Vézina F. How low can you go? An adaptive energetic framework for interpreting basal metabolic rate variation in endotherms. *J Comp Physiol B*. 2017:1-18.
- Feng P, Zhao H, Lu X. Evolution of mitochondrial DNA and its relation to basal metabolic rate. *Mitochondr DNA*. 2015;26(4):566-71.
- McCrory P, Strauss B, Wahlqvist ML. *Energy balance, food intake and obesity*. Exercise and obesity London: Smith Gordon. 1994:115-30.
- SL. J. Alaghrayz Altebieh and Mabahes Allaeieh. Tehran University of Medical Sciences, Iran2005.
- Khorasani SA. *Kholasatol Hekmah*. Medicine 1st vol Qom: Ismailian. 2006:52-146.
- Sina AI. *Al-Qanun fi al-tibb*2005.
- Zhou X, Mao D, Luo J, Wu J, Zhuo Q, Li Y. Study of Basal metabolic rate of 81 young adults aged 20-29 years old in Changsha. *Zhonghua yu fang yi xue za zhi [Chin J Prev Med]*. 2017;51(7):642-6.
- Ali N, Mahmood S, Manirujjaman M, Perveen R, Nahid A, Ahmed S, et al. Hypertension prevalence and influence of basal metabolic rate on blood pressure among adult students in Bangladesh. *BMC Public Health*. 2018;18(1):58.
- Boratyński JS, Jefimow M, Wojciechowski MS. Individual differences in the phenotypic flexibility of basal metabolic rate in Siberian hamsters are consistent on short- and long-term timescales. *Physiol Biochem Zool*. 2017;90(2):139-52.
- Lee HJ, Yang SJ. Aging-related correlation between serum sirtuin 1 activities and basal metabolic rate in women, but not in men. *Clin Nutr Res*. 2017;6(1):18-26.
- Anthanont P, Jensen MD. Does basal metabolic rate predict weight gain? *Am J Clin Nutr*. 2016;104(4):959-63.
- Maximov AL, Belkin VS, Kalichman L, Kobylansky ED. Adaptive changes in basal metabolic rate in humans in different eco-geographical areas. *Colleg Antropol*. 2015;39(4):887-92.
- Nilsson JF, Nilsson JÅ. Fluctuating selection on basal metabolic rate. *Ecol Evol*. 2016;6(4):1197-202.
- Rezadoost H, Karimi M, Jafari M. Proteomics of hot-wet and cold-dry temperaments proposed in Iranian traditional medicine: A Network-based Study. *Scientific reports*. 2016;6:30133.
- Parvinroo S, Kamalinejad M, Sabetkasaei M. Pharmacological concepts of temperament in Iranian Traditional Medicine. *Iran J Public Health*. 2014;43(10):1463-5.
- Emami M, Nazarinia MA, Rezaeizadeh H, Zarshenas MM. Standpoints of traditional Persian physicians on geriatric nutrition. *J Evid-based Complem Altern Med*. 2014;19(4):287-91.
- Parvinroo S, Naghibi F, Zahediasl S, Kamalinejad M, Sabetkasaei M. The effects of seeds with hot and cold temperaments on serum thyroid hormones, corticosterone and urine vanillylmandelic acid concentrations of healthy rats. *J Ethnopharmacol*. 2014;156:216-21.
- Rezaeizadeh H, Alizadeh M, Naseri M, Ardakani MS. The traditional Iranian medicine point of view on health. *Iran J Publ Health*. 2009;38(1):169-72.
- Alizadeh M, Khadem E, Aliasl J. Diagnosis protocol of stomach distemperament for clinical practice in Iranian traditional medicine: A narrative review. *Iran J Public Health*. 2017;46(7):877.
- Zeinalian M, Eshaghi M, Hadian M, Naji H, Marandi SMM, Asgary S. Eight essential foods in Iranian traditional medicine and their role in health promotion and well-being. *Int J Prev Med*. 2017;8.
- Miraj S, Alesaeidi S, Kiani S. A systematic review of the relationship between dystemperament (sue Mizaj) and treatments and management of diseases (Ilaj and Eslah-e-Mizaj). *Electr Phys*. 2016;8(12):3378.
- Kopaei R, Khajegir A, Kiani S. The association between dystemperament and prevention of diseases: A systematic review. *J Clin Diag Res: JCDR*. 2016;10(9):YE01.
- Farsani GM, Movahhed M, Motlagh AD, Hosseini S, Yunesian M, Farsani TM, et al. Is the Iranian Traditional Medicine warm and cold temperament related to Basal Metabolic Rate and activity of the sympathetic-parasympathetic system? Study protocol. *J Diab Metab Disord*. 2014;13(1):74.
- Shahabi S, Hassan ZM, Mahdavi M, Dezfouli M, Rahvar MT, Naseri M, et al. Hot and cold natures and some parameters of neuroendocrine and immune systems in traditional Iranian medicine: A preliminary study. *J Altern Complement Med*. 2008;14(2):147-56.
- Mojahedi M, Naseri M, Majdzadeh R, Keshavarz M, Ebadini M, Nazem E, et al. Reliability and validity assessment of Mizaj questionnaire: a novel self-report scale in Iranian traditional medicine. *Iranian Red Crescent Med J*. 2014;16(3).
- Compher C, Frankenfield D, Keim N, Roth-Yousey L, Group EAW. Best practice methods to apply to measurement of resting metabolic rate in adults: A systematic review. *J Am Diet Assoc*. 2006;106(6):881-903.

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