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## Comparative study on physical and psychological profiles of height-weight matched athlete and non-athlete

**Richa Dhiman**

### Abstract

The evolution of life is a mystery in spite of the rapid advancement of the different scientific explanations as it is impossible to reach in that era of 'origin of life'. So, there are some possibilities regarding the origin of life those are (i) Special Creation: Supernatural power or divine forces are the reason for creation of life, (ii) Extraterrestrial Origin: Life supposed to be transformed from another planet and (iii) Spontaneous Origin: Life has formed with the associations of the molecules. Till date science does not provide any authentic explanation regarding the origin of Universe in the controversial 'Big Bang' theory for evolution of the Universe and also has not been able to provide a satisfactory explanation regarding the 'origin of life'. After a long period of time, the concept "Men are from Mars and Women are from Venus" has emerged and consequently different arguments was also emerged on this concept that men and women aren't from different planets after all. Small differences between men's and women's comforting skills, but not enough to claim the sexes are their own cultures or to come from different planets. Men and women have found to differ in all areas of their lives. They not only communicate differently but also think, feel, perceive, react, respond, love, need, and appreciate differently. As a result of that they are as if seem to be from different planets, speak in different languages and need different nourishment. Humankind can be differentiated from different perspectives, such as biological characteristics, behavioral traits and sociological contexts. It is determined based on the objectives of the study. The various aspects of methods and materials presented in this chapter are related to the study. The study was conducted on one hundred and twenty individuals (N 120) out of which sixty were athletes and they sub-divided into thirty male athletes (Group – A, n 30) and thirty female athletes (Group - C, n 30), selected from different colleges, universities, districts and club teams of West Bengal. Besides sixty were non-athletes, they were also subdivided into thirty male non-athletes (Group – B, n 30) and thirty female non-athletes (Group - D, n 30) selected from different colleges and Universities students of West Bengal. 'The subjects' were selected according to the following purposive sampling criteria: (a) the height range of the subjects was from 157.5 cm to 162.5 cm, (b) weight range of the subjects were 52.5 kg to 55.5 kg, (c) Age was within 20-25 years and (d) the education level of the subjects was at least graduation level in any academic discipline. All the subjects belonged to small frame size. Self-efficacy of the four groups had difference. The non-male athlete group was superior in self-efficacy followed by male athlete group, female athlete group and female non-athlete group respectively. Difference existed among the groups, except two male groups and also two athlete groups. On the basis of the results of the study, the following conclusions were drawn.

**Keywords:** physical, psychological, height-weight matched, athlete, non-athlete

### Introduction

The evolution of life is a mystery in spite of the rapid advancement of the different scientific explanations as it is impossible to reach in that era of 'origin of life'. So, there are some possibilities regarding the origin of life those are (i) Special Creation: Supernatural power or divine forces are the reason for creation of life, (ii) Extraterrestrial Origin: Life supposed to be transformed from another planet and (iii) Spontaneous Origin: Life has formed with the associations of the molecules. Till date science does not provide any authentic explanation regarding the origin of Universe in the controversial 'Big Bang' theory for evolution of the Universe (Arp *et al.*, 1990) [2] and also has not been able to provide a satisfactory explanation regarding the 'origin of life'.

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After a long period of time, the concept "Men are from Mars and Women are from Venus" (Gray, 2004) [8] has emerged and consequently different arguments was also emerged on this concept that men and women aren't from different planets after all. Small differences between men's and women's comforting skills, but not enough to claim the sexes are their own cultures or to come from different planets (George *et al.*, 2004). Men and women have found to differ in all areas of their lives. They not only communicate differently but also think, feel, perceive, react, respond, love, need, and appreciate differently. As a result of that they are as if seem to be from different planets, speak in different languages and need different nourishment (Gray, 2004) [8].

Humankind can be differentiated from different perspectives, such as biological characteristics, behavioral traits and sociological contexts.

### Biological Characteristics

The biological attributes represent the category that is used to represent the biological (structural and functional) characteristics of a person. The representation of the biological characteristics can be done for several reasons such as identification, verification (access control), criminal investigation, healthcare etc.

### Influence of Genetics

Genetic sex of human being is identified at the initial stage of conception when the female's egg with its X chromosome joins with the male sperm with its X or Y chromosome, during this stage, the physiological sex differences that appear in the later years of life that are established by the influence of the hormones.

### Sex and Gender Difference

The term 'Sex' refers to the biological and physiological characteristics that define male and female (WHO, 2009). On the other hand, the term 'Gender' refers to those social, cultural, economic, political and psychological traits associated with sexes. In most of the society, it is observed over the years, that males and females have difference in activities, participation in decision making and control of resources, and in most of the societies the women group have less access to control resources, decision making than men (Desprez, *et al.*, 1987) [4].

### Physical Characteristics:

Physical characteristics comprises of body shape, size, composition, proportion and physical fitness. One can identify an individual according to his/her physical appearance. Greek philosopher Plato more than 2000 years ago, stated about individual difference that no two persons are born exactly alike (Nazimuddin, 2015). Individuals are differing not only according to the interaction of the genetic codes and environmental factors but the difference is seen in male and female also. The genetic codes and environmental factors are strongly correlated with physical characteristics of male and female (Nicholson, 1993; Parsons, 1980).

### Physical Fitness

Physical fitness is a set of attributes that people have or achieve. Being physically fit has been defined as "the ability to carry out daily tasks with vigor and alertness, without undue fatigue and with ample energy to enjoy leisure-time pursuits and to meet unforeseen

emergencies" (President's Council on Physical Fitness and Sports, 1971). The most frequently cited components fall into two groups since 1980s those are (i) related to health and (ii) related to skills that pertain more to athletic ability (Pate, 1983).

### Statement of the Problem

Against these backdrops, the researcher tried to find out the difference among the height-weight matched male and female athletes and non-athletes of our population in terms of their physical and psychological characteristics.

Hence, the study was titled as "Comparative Study on Physical and Psychological Profiles of Height-Weight Matched Athlete and Non- Athlete".

### Purpose of the Study

To find out the difference in physical characteristics as well as psychological characteristics of height-weight matched male and female athlete and non-athlete.

### Delimitation of the Study

1. Height-Weight ranges of the subjects were set at 157.5-162.5 cm and 52.5-55.5 kg with small frame size and age range of the subjects was 20-25 years only.
2. Sports background of the subject(s) was set at minimum district level participation in any sport discipline in West Bengal.
3. Physical profile was measured through anthropometric characteristics and physical fitness and psychological profile was measured by coping ability, psychological hardiness and self-efficacy.

### Limitations of the Study

1. All the tests of this study could not be conducted on the same day for everyone and even on the same individual due to reasonable ground.
2. More sophisticated instruments and modern tests could have yielded more accurate results for this study.
3. Other than the three psychological characteristics remaining behavioral characteristics were not considered in this study due to time factor.

### Methodology

It is determined based on the objectives of the study. The various aspects of methods and materials presented in this chapter are related to the study.

### Subjects of the Study

The study was conducted on one hundred and twenty individuals (N = 120) out of which sixty were athletes and they sub-divided into thirty male athletes (Group – A, n = 30) and thirty female athletes (Group - C, n = 30), selected from different colleges, universities, districts and club teams of West Bengal. Besides sixty were non-athletes, they were also subdivided into thirty male non-athletes (Group – B, n =30) and thirty female non-athletes (Group - D, n =30) selected from different colleges and Universities students of West Bengal. 'The subjects' were selected according to the following purposive sampling criteria: (a) the height range of the subjects was from 157.5 cm to 162.5 cm, (b) weight range of the subjects were 52.5 kg to 55.5 kg, (c) Age was within 20-25 years and (d) the education level of the subjects was at least graduation level in any academic discipline. All the subjects belonged to

small frame size.

### Criterion Measure

The study was conducted on the profile of height-weight matched athlete and non- athlete males and females in a particular age range.

**A. Personal Data:** Age (years), Height (cm), Weight (kg).

### B. Physical Characteristics

#### 1. Anthropometric variables

**i. Body Circumferences (cm):** a) Upper Arm Circumference, b) Upper Arm Circumference (flexed), c) Waist Circumference, d) Hip Circumference, e) Mid-Thigh Circumference, f) Calf Circumference, g) Wrist Circumference.

**ii. Skinfold Thickness (mm):** a) Biceps Skinfold, b) Triceps Skinfold, c) Subscapular Skinfold, d) Suprailiac Skinfold, e) Abdominal Skinfold, f) Mid-thigh Skinfold, g) Medial-calf Skinfold

**iii. Somatotype – measured through:** a) Height (cm), b)

Weight (kg), c) Circumference (cm): Upper Arm Circumference (Flexed), Calf Circumference.

**iv. Skinfold Thickness (mm):** a) Biceps Skinfold, b) Triceps Skinfold, c) Subscapular Skinfold, d) Supraspinale Skinfold, e) Medial Calf Skinfold.

**v. Breadth (cm):** a) Bi-epicondylar Humerus Breadth b) Bi-epicondylar Femur Breadth.

#### 2. Physical Fitness

**i. Health-Related Physical Fitness:** a) Muscular Strength, b) Muscular Strength- Endurance, c) Flexibility, d) Cardio-Respiratory Endurance, e) Body Composition: Body Mass Index, Body Fat Percentage, Lean Body Mass, Fat Mass, Waist-to-Hip Ratio.

**ii. Skill-Related Physical Fitness:** a) Speed (Speed of Movement) b) Static Balance, c) Reaction Time, d) Muscular Power C. Psychological Characteristics: a) Coping ability, b) Personality Hardiness, c) Self-efficacy.

**B. Psychological Characteristics:** a) Coping ability, b) Personality Hardiness, c) Self- efficacy.

#### Tools and Techniques Used

Parameter	Variable	Method/ Tool/ Technique Used	Unit	
Personal Data	Age	Calculated from Date of Birth	Years	
	Height	A centimeter marked vertical wall	cm	
	Weight	Standard Weighing Machine	kg	
	Frame Size	Male: $r > 10.4 =$ Small Frame Female: $r > 11.0 =$ Small Frame	-	
<b>Physical Characteristics</b>				
Anthropometric Measurements	Circumferences	Measuring tape	cm	
	Skinfolds	Skinfold Caliper	mm	
	Breadth	Sliding Caliper	cm	
	Somatotype	Heath and Carter (1990) formula	-	
<b>HRPF</b>				
Physical Fitness	MS	Hand Dynamometer	kg	
	MSE	1-min. Sit-up Test (Pollock & Wilmore, 1978)	No./min.	
	Flexibility	Sit-and-reach Test (Wells & Dillon, 1952)	cm	
	CRE	Queen's College Step Test (Mc Ardle <i>et al.</i> , 1972)	ml/kg/min	
	<b>Body Composition</b>			
	BMI	Weight /Height in meter square	kg/m <sup>2</sup>	
	%BF	Skinfold method (Durnin & Womersley, 1974)		
	LBM	(Body Mass - Fat Mass)	kg	
	FM	(Total Body Weight × % BF)	kg	
	WHR	Waist Circumference ÷ Hip Circumference		
	<b>SRPF</b>			
	SPM	Speed of Movement Test (Nelson, 1982)	s	
	Balance (Static)	Stork Stand Test (Johnson & Nelson, 1982)	s	
Reaction Time	Hand Reaction Test (Nelson, 1982)	s		
Muscular Power	Vertical Jump Test (Sargent, 1921)	Watts		
<b>Psychological Characteristics:</b>				
Variable	Method/ Tool/ Technique Used			
Coping Strategies	Srivastava (2001) Coping Strategies Scale (Bengali Version)			
Personality Hardiness	Singh (2008) Personality Hardiness Scale (Bengali Version)			
Self-Efficacy	Mathur and Bhatnagar (2012) Self-Efficacy Scale (Bengali Version)			

Statistics used for this study were Mean, Standard Deviation, ANOVA and Post- hoc LSD Test using SPSS 20 version. Level of significant difference between/among the groups was set at 0.05 level of confidence.

The reference section contains the citation of the earlier researchers and their research endeavors following APA 6th Edition (2015) of referencing style.

### Findings of the Study

#### On Physical Characteristics Anthropometric measurements

##### Body Circumferences

- Upper arm circumference had no difference among the height-weight-matched male and female athletes and non-athletes four groups of the study.
- Upper arm circumference (flexed) of four groups had having difference. The upper arm circumference (flexed)

was superior in male non-athlete group followed by male athlete, female non-athlete and female athlete groups respectively. Difference existed between male and female athlete groups, male and female non-athlete groups, male non-athlete and female athlete groups, and between female athlete and non-athlete groups. However, no difference was found between male athlete and non-athlete groups.

3. Waist circumference of four groups were at par as no difference existed between waist circumference among the four groups.
4. Hip circumference had difference among the four groups. The hip circumference was superior in female non-athlete group followed by female athlete, male non-athlete and male athlete groups respectively. Difference existed between male and female athlete groups, male non-athlete and female athlete groups, and between male and female non-athlete groups. However, no difference existed between athlete and non-athlete groups of both genders.
5. Calf circumferences were at par among the height-weight-matched male and female athletes and non-athletes.

### **Skinfold Thickness**

1. Biceps's skinfold thickness had difference among the height-weight-matched male and female athlete and non-athlete groups.

The female non-athlete group had the superior biceps skinfold followed by female athlete, male non-athlete and male athlete groups. Difference existed between male and female athlete groups, female athlete and female non-athlete group and between male non-athlete with both of the female athlete and non-athlete groups.

2. Triceps skinfold thickness had difference among the four groups.

The female non-athlete group had the superior triceps skinfold followed by female athlete, male non-athlete and male athlete groups. Difference existed in all the inter-group comparisons.

3. Subscapular skinfold thickness had difference among the four groups.

The female non-athlete group had the superior subscapular skinfold thickness followed by female athlete, male non-athlete and male athlete groups. Difference existed in all the inter-group comparisons.

4. Suprailiac skinfold thickness had difference among the four groups.

The female non-athlete group had the superior suprailiac skinfold thickness followed by female athlete, male non-athlete and male athlete groups. Difference existed among the groups in inter-group comparisons.

5. Abdominal skinfold thickness had difference among the four groups.

The female non-athlete group had the superior abdominal skinfold thickness followed by male non-athlete, female non-athlete and male athlete groups. Difference existed between male athlete and non-athlete groups, male non-athlete and female athlete groups and between female athlete and non-athlete groups. However, no difference observed between male and female athlete groups and between male and female non-athlete groups.

6. Mid-thigh skinfold thickness had difference among the four groups.

The female non-athlete group had the superior mid-thigh

skinfold followed by female athlete, male non-athlete and male athlete groups. Difference existed among the four groups.

7. Medial-calf skinfold thickness had difference among the four groups.

The female non-athlete group had the superior medial-calf skinfold followed by female athlete, male non-athlete and male athlete groups. Difference existed among the four groups.

### **Somatotype**

Height-weight matched male and female athletes and non-athletes had difference

in endomorphy and mesomorphy components but not in ectomorph component of four groups. The highest endomorphic characteristics was observed in female non-athlete group followed by female athlete, male non-athlete and male athlete groups. Among the four groups each group had unique characteristics of its' own. Male athlete group had the highest mesomorphic characteristics followed by male non-athlete, female athlete and female non-athlete groups.

The somatotype characteristics for male athlete group was 2.08-3.99-2.70 (endomorph-mesomorph-ectomorph) i.e., ectomorphic-mesomorph, for male non-athlete group: 2.87-3.86-2.62 i.e., balanced mesomorph, for female athlete group: 4.34-3.55-2.55 i.e., mesomorphic-endomorph and for female non-athlete group: 6.02-3.43-2.54 i.e., mesomorphic-endomorph.

### **Physical Fitness**

#### **Health-Related Physical Fitness**

1. Muscular strength (Right Hand) had difference among the height-weight matched male and female athletes and non-athletes. The male athlete group was superior in muscular strength followed by male non-athlete, female athlete and female non-athlete group. Difference existed between male and female athlete groups, male non-athlete and female athlete groups, male non-athlete group and female non-athlete group and between female athlete and non-athlete groups. However, no difference existed between male athlete and non-athlete groups.

2. Muscular strength (left Hand) had difference among the four groups. The male athlete group had the superior level in muscular strength followed by male non-athlete, female athlete and female non-athlete groups. Difference existed between male and female athlete groups, male non-athlete and female athlete groups, male non-athlete and female non-athlete groups and between female athlete and non-athlete groups. However, no difference existed between male athlete and non-athlete groups.

3. Muscular strength endurance (MSE) had difference among the four groups. The male athlete group was superior in MSE followed by female athlete, male non-athlete and female non-athlete groups. Difference existed between male athlete and non-athlete groups, male and female athlete groups, male non-athlete and female non-athlete groups and between female athlete and non-athlete groups. However, no difference existed between male non-athlete and female athlete groups.

4. Flexibility had difference among the four groups. The female athlete group had superior in flexibility followed by male athlete, female non-athlete and male non-athlete groups. Difference existed between male athlete with non-athlete groups, male non-athlete and female athlete groups and between female athlete and non-athlete

groups. However, no difference existed between male and female athlete groups and between male and female non-athlete groups.

5. Cardio respiratory endurance (CRE) had difference among the four groups. The male athlete group was superior in CRE followed by male non-athlete, female athlete and female non-athlete groups. Difference existed between CRE among the four groups.
6. Body fat percentage (%BF) had difference among the four groups. The female non- athlete group was superior in %BF followed by female non-athlete, male non-athlete and male athlete groups. Difference existed between %BF among the four groups.
7. Fat mass (FM) had difference among the four groups. The female non-athlete group was superior in FM followed by female non-athlete, male non-athlete and male athlete groups. Difference existed between FM among the four groups.
8. Lean Body mass (LBM) had difference among the four groups. The male athlete group was superior in LBM followed by male non-athlete, female athlete and female non- athlete groups. Difference existed between LBM among the four groups.
9. Waist-to-hip ratio (WHR) had difference among the four groups. The male athlete group had superior in WHR followed by male non-athlete, female non-athlete and female athlete groups. Difference existed between male and female athlete groups, male non-athlete and female athlete groups and between male and female non-athlete groups. However, no difference existed in WHR between the male athlete non-athlete groups and female athlete and non-athlete groups.

#### **Skill-Related Physical Fitness**

1. Speed of movement had difference among the height-weight-matched athletes and non- athlete males and females. The male non-athlete group was superior in speed of movement followed by female non-athlete group, female athlete and male athlete groups. Difference existed between male athlete and non-athlete groups, male non- athlete and female athlete groups and between male and female non-athlete groups. However, no difference existed in speed of movement between male and female athlete groups and between female athlete and non-athlete groups.
2. Static balance of four groups had difference. The male athlete group was superior in static balance followed by male non-athlete group, female athlete group and female non-athlete groups. Difference existed among the four groups.
3. Reaction time (RT) had difference among the four groups. The male athlete group was superior in RT followed by female athlete group, female non-athlete group and male non-athlete groups. Difference in RT existed between male athlete and non-athlete groups, male non-athlete and female athlete groups and between male and female non- athlete groups. However, there was no difference in RT between male and female athlete groups and between female athlete and non-athlete groups.
4. Muscular Power had difference among the four groups. The male athlete group was superior in muscular power followed by male non-athlete group, female athlete group and female non-athlete group. Difference in muscular power was existed among the four groups, except

between male athlete and non- athlete groups.

#### **On Psychological Characteristics Coping Strategies**

Coping strategies of height-weight matched male and female athletes and non-athletes had difference.

1. Approach coping strategies of four groups was having difference. The female athlete group was superior in active/approach/ problem focused coping strategies followed by male athlete group, male non-athlete group and female non-athlete group. In approach coping strategies, only difference was found in male non-athlete and female athlete groups, and female athlete and non-athlete groups but in other cases no difference was found.
2. In Avoidance coping strategies, difference was observed in both male and female athlete group, male non-athlete and female athlete groups, and female athlete and non-athlete groups though in other cases no difference was found.

#### **Personality Hardiness**

Personality hardiness of the four groups had difference. The male athlete group was superior in personality hardiness followed by male non-athlete group, female athlete group and female non-athlete group respectively. Difference in personality hardiness was observed among the four groups except male and female athlete group, and between male non-athlete group and female athlete group.

#### **Self-efficacy**

Self-efficacy of the four groups had difference. The non-male athlete group was superior in self-efficacy followed by male athlete group, female athlete group and female non-athlete group respectively. Difference existed among the groups, except two male groups and also two athlete groups.

#### **Conclusions**

On the basis of the results of the study, the following conclusions were drawn.

#### **On Physical characteristics**

1. The height-weight matched male and female athletes and non-athletes had no difference in upper arm, waist and calf circumferences among the four groups. Difference existed among the four groups in upper arm (F), hip and mid-thigh circumferences. Highest upper arm circumference possessed by the male athlete groups followed by female non-athlete and athlete groups. Highest hip circumference characterized by both the female groups followed by male non-athlete and athlete groups. Mid-thigh circumference had the highest value among female athletes followed by male athletes and female non-athletes then male non-athletes.
2. Among seven skinfold thickness, inter-group differences observed among the four groups in triceps, subscapular, mid-thigh and medial calf sites. However, difference existed in all inter-group comparisons, except between both of male groups in biceps and suprailiac skinfolds and between male non-athlete and female athlete groups in abdominal skinfold. difference existed between athlete and non-athlete groups of both genders and the athlete groups had less skinfold thickness than their non-athlete counterpart.
3. Height-weight matched athletes and non-athletes' males and females had difference in endomorph and mesomorph characteristics but not in ectomorphy

characteristics.

The four groups had difference in endomorphy characteristics. In mesomorphy characteristics, difference existed between male and female athletes and the non-athletes. Somatotype characteristics of four groups were - male athletes: ectomorphic- mesomorph, male non-athletes: balanced mesomorph, and both female athletes and non-athletes: mesomorphic-endomorph.

4. The performing four components of HRPF of four groups had difference. In descending order of fitness level in MS, MSE, and CRE the groups were male athlete, male non-athlete, female athlete and female non-athlete. In flexibility, it was female athlete, male athlete, female non-athlete and male non-athlete.
5. Body composition of four groups had also difference among them. Fat mass and %BF from lower to higher value among them were likely to be male athletes, male non-athletes, female athletes and female non-athletes; and for LBM, it was just reversed. In WHR, lowest to highest values were among female athletes, female non-athletes, male non-athletes and then male athletes.
6. Skill-Related physical fitness of four groups had yielded heterogeneous findings. Two trends were observed in SRPF. In speed of movement and reaction time, male athlete group was the best followed by female athlete, female non-athlete and male non-athlete groups. However, in static balance and muscular power, from the superiority to inferiority direction, the groups' status was the male athletes, male non-athletes, female athletes and female non-athletes respectively.

#### On Psychological Characteristics

1. Coping strategies of the four groups had difference. Female athlete group had better than their non-athlete counterpart in approach/problem focused coping strategies and avoidance/emotion focused coping strategies. Though both the male groups were having the similar coping ability.
2. Personality hardiness among the four groups had difference. Athletes of both genders were at par in personality hardiness but in other cases, the groups had difference in personality hardiness, except male non-athlete and female athlete groups.
3. Self-efficacy among the four groups had difference. Self-efficacy had difference between female athletes and non-athletes but not in between the male groups. Male and female athletes were at par in self-efficacy. Female non-athletes had the lower level of self-efficacy.

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