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# Inter correlation study of anthropometric variables of Indian collegiate students

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**Abstract**
**Background:** Handgrip is a predictor of physical fitness, hand functions, and nutritional status. It is affected by many factors including age, sex, body mass index, and hand grip strength.
**Aim:** To Inter Correlate various anthropometric variables in Indian collegiate students.
**Materials and Methods:** This study included 105 students of both sexes (52 females and 53 males) selected from Rajeev Gandhi College, Bhopal, India using non-probability purposive sampling method. Their anthropometric parameters including height, weight, B. M. I. and hand grip strength were assessed using routine techniques. The handgrip was measured by using a handheld dynamometer. Hand preference was determined by asking which hand was used to write.
**Results:** The results were found to be statistically significant.
**Conclusion:** There is positive correlation between many variables.

**Keywords:** anthropometric, body mass index, dynamometer, handgrip, dominant, non-dominant

## Introduction

Anthropometric and physical fitness characteristics provides important information about normality of body size, health condition, and body shape (Munoz-Catol *et al*., 2007; Kurt, Catokkas & Atalog, 2011) [1, 2]. Human body proportions give us information about the growth of each body segment. The goal of most studies has been to identify the level of physical fitness characteristics at different ages; to evaluate anthropometric characteristics for talent identification or for the level of body development; to calculate the proportional ratios in predicting some diseases; or to evaluate the harmony of the body. All are important to screening for health risks, especially for metabolic and cardiovascular diseases (De Lorenzo *et al*, 2013; Ashwell&Hsieh, 2005) [3, 4]. Additionally, physical activity is an important means to reduce and control weight and diverse health risk factors (Zaccagni, 2013) [5].

It is interesting to study some of these characteristics in the students of the college as they will be the next generation who will educate the younger generation about having an active life style and good health. The aim of the present work was to analyze the anthropometrical characteristics and their correlation among themselves.

## Materials and Methods

This study was done at Rajeev Gandhi College, Bhopal, India during the period from 15th March 2017 to 20th January 2018. A convenient sample of 105 collegiate students of both sexes of age group 17- 23 years were chosen using non-probability purposive sampling method. Objectives of the study were explained to participants. They were assured that information obtained would be anonymous and confidential. Data were collected using a questionnaire designed for the purpose of the study. It included socio-demographic information (name, age and sex). Those who were involved in active muscle training exercises and those who had a history of fracture in the past 3 months, a deformity, or pain at rest or movement in the upper arms were excluded.

Height was measured to the nearest centimeter using a stadiometer pole while the subject is in standing position without footwear and heals together. The weight was measured to the nearest 0.5 Kg, with light clothes and without footwear, by using a portable digital weighing scale. The body mass index (BMI) was calculated using Quetelet's index [12] The handgrip strength in

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kilogram of the dominant hand was measured by using a handgrip dynamometer (Futaba Professional Hand Grip Dynamometer).

Measurement was done while the participant in standing position with shoulder adducted and neutrally rotated and elbow in full extension. The participants were asked to press the handle of the dynamometer with maximum strength. The maximal voluntary contraction was sustained for at least 5 seconds and it was recorded as the handgrip strength in kilograms (kg). Three readings were taken with a gap of 10 minutes and the maximum reading was taken for analysis [13]. The Ethical Committee of Rajeev Gandhi College, Bhopal approved the study. Each participant voluntarily provided written informed consent before participating. Statistical analysis was done using SPSS Version 23 (IBM Corp., Chicago, Illinois, USA). The results were presented in tables and graphs.

**Results and Discussion**

**Table 1:** Descriptive Statistics

| Descriptive Statistics | Mean | SD | N |
|---|---|---|---|
| Age | 20.16 | 1.618 | 105 |
| Height (mt) | 1.60 | 0.139 | 105 |
| Weight (Kg) | 54.56 | 8.262 | 105 |
| BMI | 21.27 | 3.787 | 105 |
| Hand Grip strength (dominant hand) Kg | 32.43 | 18.872 | 105 |
| Hand Grip strength ( non dominant hand) | 30.92 | 18.103 | 105 |

**Table 2:** Gender Specific Mean and Standard Deviation Values

| Gender | Female | | | Male | | |
|---|---|---|---|---|---|---|
| | Mean | SD | N | Mean | SD | N |
| Age | 19.88 | 1.64 | 52 | 20.43 | 1.56 | 53 |
| Height (mt) | 1.57 | .13 | 52 | 1.64 | .14 | 53 |
| Weight (Kg) | 53.89 | 8.21 | 52 | 55.22 | 8.34 | 53 |
| BMI | 21.82 | 4.16 | 52 | 20.72 | 3.34 | 53 |
| Hand Grip strength (dominant hand) Kg | 26.87 | 16.28 | 52 | 37.88 | 19.78 | 53 |
| Hand Grip strength ( non dominant hand) | 25.42 | 15.25 | 52 | 36.32 | 19.17 | 53 |

**Table 3:** Correlation Statistics

| Pair 1 | vs | Pair 1 | r value | P value |
|---|---|---|---|---|
| Age | vs | Height (mt) | -.200* | 0.041 |
| Age | vs | Weight (Kg) | 0.059 | 0.549 |
| Age | vs | BMI | .304** | 0.002 |
| Age | vs | Hand Grip strength (dominant hand) Kg | -0.010 | 0.923 |
| Age | vs | Hand Grip strength ( non dominant hand) | 0.076 | 0.439 |
| Height (mt) | vs | Weight (Kg) | .522** | <0.001 |
| Height (mt) | vs | BMI | -.471** | <0.001 |
| Height (mt) | vs | Hand Grip strength (dominant hand) Kg | .632** | <0.001 |
| Height (mt) | vs | Hand Grip strength ( non dominant hand) | .487** | <0.001 |
| Weight (Kg) | vs | BMI | .412** | <0.001 |
| Weight (Kg) | vs | Hand Grip strength (dominant hand) Kg | .526** | <0.001 |
| Weight (Kg) | vs | Hand Grip strength ( non dominant hand) | .452** | <0.001 |
| BMI | vs | Hand Grip strength (dominant hand) Kg | -0.099 | 0.314 |
| BMI | vs | Hand Grip strength ( non dominant hand) | -0.019 | 0.846 |
| Hand Grip strength (dominant hand) Kg | vs | Hand Grip strength ( non dominant hand) | .822** | <0.001 |
| *. Correlation is significant at the 0.05 level (2-tailed). | | | | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | |

As shown in Table no 3. Statistical significance is there between age and height. There is negative correlation between age and height. No statistical significance is there between age and weight. They are independent variables; it means increase of weight is not dependent of age of a person. Statistical significance is there between age and B.M.I. It means that as the age increases B.M.I. also increases. There is positive correlation between the two. There is no statistical significance in correlation of age versus dominant hand grip strength. There is no relation of age to the hand grip strength of dominant hand. There is no statistical significance in correlation of age versus non dominant hand grip strength. There is no relation of age to the hand grip strength of non dominant hand. Height versus weight there is significant correlation as when the height increases the weight increases. Height versus B.M.I. there is significant correlation as more the height more will be the B.M.I. Height versus Dominant hand grip strength there is positive correlation. Height versus Non Dominant hand grip strength there is positive correlation. Weight versus B.M.I. significant results with positive correlation were seen. Weight versus dominant hand grip strength, there was positive correlation with statistical significance observed. Weight versus non dominant hand grip strength, there was positive correlation with statistical significance observed. B.M.I. versus dominant hand grip strength, there was negative correlation with no statistical significance observed. B.M.I. versus non dominant hand grip strength, there was negative correlation with no statistical significance observed. Hand grip strength dominant versus non dominant hand grip strength there was positive correlation with statistical significance observed.

The study correlated BMI and other anthropometric

characteristics with dominant and non dominant handgrip strength of Students. The results revealed strong positive correlations between age, height and weight with handgrip strength in both males and females. Sartorio *et al* (2002) had reported that the age dependent increase of hand grip strength in males and females were strongly associated with changes of muscle mass during the childhood. The results from the present study are consistent with previous researches demonstrating stronger grip for men than women within the same age strata, and that hand grip strength decreases with advancement in age (Chatterjee and Chowdhuri, 1991; Bohannon *et al*., 2006; Charles and Burchfiel, 2006).

Based on the present study, males also showed a higher mean value for Hand grip strength and this agrees with the study conducted by Shyamal and Sartinder (2011), which showed that males have higher mean values of all the anthropometric parameters than females.

## Conclusion
In the present study it was concluded that a person with good physique has more dominant and non dominant hand grip strength. Also it was concluded that the person with greater dominant handgrip strength posses greater non dominant hand grip strength.

It may be concluded that handgrip strength had some strong positive correlations with all the variables studied

## Acknowledgements

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