

# Association of Craniofacial Anthropometry and Personality with Impact of Metacognitive and Emotional Intervention among Medical Students: A Research Protocol

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## ABSTRACT

**Introduction:** Physiognomic evaluation of the human face has been widely considered in computer-based visual applications to know the characteristic properties of human. This had given rationality for the present study to be planned on craniofacial anthropometry and its relationship with personality traits in medical students.

**Need of the study:** The present study will find out the association of craniofacial anthropometry with personality traits and also the impact of metacognitive and emotional intervention on personality types and skill of medical students.

**Aim:** Evaluate the effectiveness of different craniofacial anthropometry; cephalic index, forehead width, forehead length, bizygomatic width, bigonial width, upper facial index and facial index with the type of personality traits and impact

of metacognitive and emotional interventions on personality among medical students.

**Materials and Methods:** A cross-sectional interventional analytical study on Bachelor of Medicine and Bachelor of Surgery (MBBS) undergraduate students with sample size of 293 will be conducted in Jawahar Lal Nehru Medical College, DMIMS, Wardha, Maharashtra, India. The age group of samples will be 18-30 years. The expected duration of study will be August 2022 to July 2025. The data collection will be carried out for a period of one and half year (January 2023 to June 2024). The tools for data collection shall be craniofacial anthropometric measurement, Big Five Personality Test (BFPT) questionnaire, metacognitive awareness inventory, Emotional Intelligence self-assessment Questionnaire (EIQ), Personal information Questionnaire (PIQ).

**Keywords:** Bizygomatic, Bignonial, Big five personality, Emotional intelligence, Upper facial

## INTRODUCTION

Facial anthropometry remains a cornerstone of medicine and related professions. It explores about ethnicity, sexual dimorphism and forensics, but a new array opened that the face can predict personality types and characters. The connection between face and human character strengthened by theories of development of brain and facial structures [1]. The prenatal face and brain, both comes from primitive ectoderm and influence each other at the time of development [2]. The face is essentially supported by the growing brain which undergoes extensive morphogenetic changes [3]. Corman L, divided the face into three levels; forehead area, maxillary area and mandibular area for analysis of intellectual, socio-emotional interest and instinctive interest [4], later supported Maclean's hypothesis of the triple brain, that the relationship existed between emotions and the different areas of the limbic system which is contained behind the maxillary area [5-7]. The inheritance of facial measurements from parents to offsprings can be the basis of transferring traits too and the aggression and trustworthiness traits have been analysed on the basis of facial anthropometry [8-11]. Forehead slant, impulsiveness and cortical thickness of the brain have been positively correlated and significant relationships between WD {Width Difference between bizygomatic arch and bigonial width} and the psychological variables were studied [12,13]. People with bizygomatic arch in contraction were more self sufficient and showed less inclination. They also displayed reluctance or reduced ability to describe and express their emotions, as compared with the subjects with the bizygomatic arch in expansion [14].

The above comparisons between facial structure and human characters created the question of the effectiveness of facial structure to understand the personality type and individual's

metacognition and emotion, which in turn affects performance among medical students [15]. The rationality behind choosing medical students is due to two factors: i) Myths and barriers for not seeking treatment by a psychiatrist or psychologist [16]; and ii) Change in medical education from knowledge and skill to communication, leadership, ethics and a good performer in the community, so, the study would provide cues of personality among medical students, which might help teachers to shape the students accordingly and study will also help to maintain good interpersonal relationship among all medical professionals. The metacognitive and emotional intervention would balance the personality traits favourable for all domains: knowledge, skills, attitude and communication. In the present study, the authors include cephalic index, forehead width, forehead length, bizygomatic width, bigonial width, upper facial index and facial index at the place of Facial Width-to-Height Ratio (fWHR) due to authentic classification given by Banister [17].

## Study Objectives

### Primary objectives:

- To find out the craniofacial anthropometric differences and its association with personality traits.
- To find out the impact of metacognitive and emotional interventions on personality traits/types and metacognitive and emotional skills.

### Secondary objectives:

- To know various types of personality among medical students.
- To assess the association between craniofacial anthropometry and personality traits.
- To find out the association between personality traits and metacognitive/emotional skills.

- To identify various socio-demographic factor which affects personality traits.

#### Research question:

- What are the association of craniofacial anthropometry; cephalic index, forehead width, forehead length, bizygomatic width, bigonial width, upper facial index and facial index with personality traits?
- What will be the impact of metacognitive and emotional interventions on personality types and metacognitive and emotional skills of medical students?

#### Hypothesis

##### Null hypothesis:

- There is no association between craniofacial anthropometry and personality traits.
- There is no effect of metacognitive and emotional intervention on personality traits/type.

##### Alternative hypothesis:

- There is association between craniofacial anthropometry and personality traits.
- There is effect of metacognitive and emotional intervention on personality traits/type.

## REVIEW OF LITERATURE

Facial Width to Height Ratio (fWHR) is mostly used parameter to judge person's character and revealed positive relation with reactive aggression in the laboratory, as well as, aggressive behaviour in hockey players [9]. Evidence suggests that violent men have wider faces than non violent men [10]. In laboratory tasks, fWHR positively predicted rates of cheating [11], and the odds of exploiting a partner's trust [18]. Consistent with their use of more aggressive behavioural strategies, men with higher fWHRs have been perceived as more aggressive, dominant and intimidating, but as less trustworthy, prosocial and desirable as a friend [18-22]. The fWHR significantly correlates with the grades from non quantitative courses but not with the grades from applied or basic quantitative courses [23]. Wide-faced forehead has shown intuitive nature with imagination, lengthy forehead people achieve permanent success and square forehead people are honest and sincere [24]. Panchu P et al., mentioned about traits of consciousness, openness and neuroticism positively correlated with metacognitive awareness while extroversion and agreeableness were negatively correlated and emotional intelligence showed positive correlation with extraversion and consciousness among males [25,26]. Emotional intelligence and metacognitive awareness both are significantly associated with academic performance [27-29].

As the present study is being planned on medical students, then this also becomes important to know that, this personality trait affects their metacognition and emotions, which determines their academic performance. The fWHR was related to academic performance in non quantitative courses but the specific mechanism driving this result of student's performance was unknown that's why the present study is first trying to correlate craniofacial anthropometry and types of personality and then seeing its relation with metacognition and emotion [22]. There is a study that says that, medical students hide for going psychological assessment [16].

## MATERIALS AND METHODS

A cross-sectional interventional analytical study on MBBS undergraduate students with a sample size of 293 will be conducted in, Jawahar Lal Nehru Medical College, DMIMS, Wardha, Maharashtra, India. The age group of samples will be 18-30 years. The expected duration of study will be August 2022 to July 2025. The data collection will be carried out for a period of one and half

year (January 2023 to June 2024). The remaining period will be utilised for analysis, interpretation of data, paper writing and write-up work of the thesis. Approval from Institutional Ethical Committee is taken and the reference number is DMIMS (DU)/IEC2022/320. Written informed consent will be obtained from the students.

**Inclusion criteria:** Individuals with no physical impairment, craniofacial trauma, facial scars, amputated limbs, visible tumours, oedema will be included.

**Exclusion criteria:** Pregnant women, individuals with craniofacial trauma, facial scars, amputated limbs, any facial tumours, oedema, and history of diabetes mellitus and those with physical signs of endocrine disorders such as dwarfism or gigantism will be excluded.

#### Study Procedure

The following tools will be used [Table/Fig-1]:

- Craniofacial anthropometric measurement:** Participants with measurements of cephalic index, forehead width, forehead length, bizygomatic width, bigonial width, upper facial index and facial index. formulas for calculating measurements are as following:

Facial index=Nasion-Gnathion Height/Bizygomatic Breadth×100

Upper facial index=Nasion-Prosthion Height/Bizygomatic Breadth×100

Forehead width=From Glabella to Trichion

Forehead length=Maximum length of forehead from hairline to hairline

Byzygomatic width: Right Zygion to left Zygion

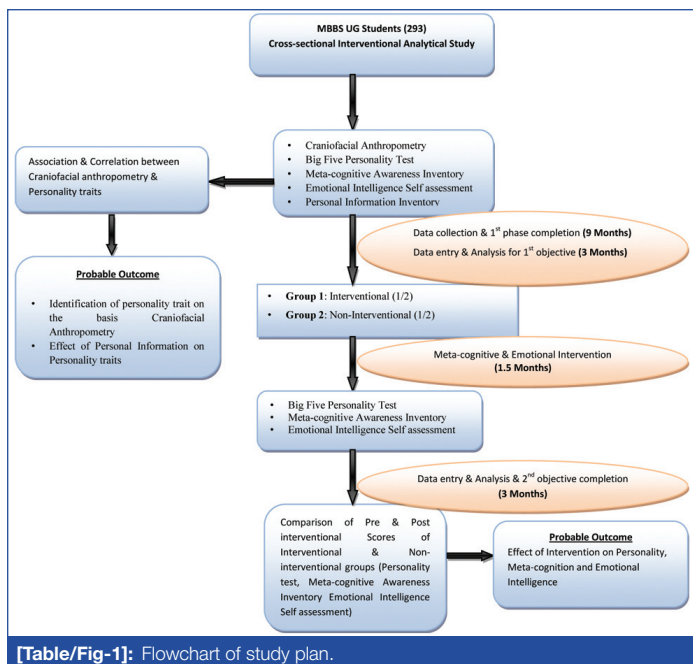
Bigonial width: Right Gonion to left Gonion

Cephalic index: Biparietal width×100/Nasion-Inion

**Procedure for taking craniofacial anthropometry:** The subjects will make to sit on the chair in an upright position and relaxed, gazing on point making Frankfurt plane and measurements will be taken. All the measurements will be taken three times and the mean value of the measurements will be considered for further analysis. For the measurement of craniofacial parameters, spreading and sliding caliper will be used and the used anatomical landmarks will be as following:

- N=Nasion: Intersection of frontonasal suture and internasal suture (just below glabella)
  - Gn=Gnathion: the lowest point on the lower border of the chin in midline
  - Zy=Zygion: the most lateral point on zygomatic prominences
  - Tr=Trichion, point of intersection between the midline of the forehead and the hairline
  - Go=Gonion: Point on mandible angle
  - Pr=Prosthion=Centre of margin of upper lip
  - In=Inion, most prominent point on external occipital protuberance
- Big Five Personality Test (BFPT) questionnaire:** The BFPT has a 50 item tool on a scale of 1-5 which are disagree, slightly disagree, neutral, slightly agree and agree. Each personality trait will have a score between 0-40. The score will be low, medium and high on the basis of mean and Standard Deviation (SD) of total sample. Within one half of SD as average score is medium and outside of that range the score can be interpreted as low or high [30]. It includes five traits extroversion, agreeableness, consciousness, neuroticism and openness. Cronbach alpha values of these traits are 0.87, 0.72, 0.80, 0.85, and 0.77, respectively [31].
  - Questionnaires/Inventories:**

**Personal Information Questionnaire (PIQ):** It consists of participants personal information, socio-economic status and socio-demographic status and medical history.



[Table/Fig-1]: Flowchart of study plan.

**Emotional Intelligence Self-assessment Questionnaire (EIQ):**

The concept of emotional intelligence was given by Goleman D and Cherniss C, later adapted by Mohapel P [32,33]. The quick emotional intelligence self-assessment questionnaire has been validated on 34 undergraduate medical students with its Cronbach alpha value 0.81. The questionnaire consists of 40 items and each item is scored as 0 (never), 1 (rarely), 2 (sometimes), 3 (often) and 4 (always). It has four domains self-awareness, self-management, social awareness and social skills.

**Metacognitive awareness inventory:** The questionnaire has two levels named knowledge about cognition and regulation of cognition [34]. Knowledge consists of declarative knowledge, conditional knowledge and procedural knowledge. Regulation consists of planning, comprehension monitoring, information management strategies, debugging strategies and evaluation. The questionnaire includes 52 items with true and false. Each true answer scores 1 and false scores 0. Low awareness will be <50% total score, moderately aware as 50-80%, and >80% as highly aware.

**Metacognitive and emotional intervention:** The duration of the intervention will be of 45 days. All the sessions will be conducted in the first four days and after 20 days, there will be two days of sessions again for problem finding and solving. The students will be divided into batches and in each batch; there will be 25-30 students. The sessions of intervention are given in [Table/Fig-2].

**Expected outcome:** For the probable results, in 1<sup>st</sup> phase, anthropometric parameters will be calculated and entered as anatomical terms such as facial index (hypereuryprosopic, euryprosopic, mesoprosopic, leptoprosopic, hyperleptoprosopic), upper facial index (hypereuryene, euryene, mesene, leptene, hyperleptene), cephalic index (dolichocephalic, mesocephalic, brachycephalic, hyperbrachycephalic and ultrabrachycephalic), forehead length (short, normal, long), forehead width (narrow, normal, large), bizygomatic width and bigonial width with WD and combination of facial index and cephalic index. Each anthropometric measurement will be compared with personality traits individually (openness, consciousness, extroversion, agreeableness, neuroticism) and personality types (a combination of traits in terms of high, moderate, low).

In 2<sup>nd</sup> phase of the study, after obtaining clusters of personality, half of the students will be selected as interventional group by simple random sampling from each cluster, and half of each clusters will

S. No.	Topics	Mode of sessions	Time (Minutes)
1.	Introductory session	Lecture+Seminar+Small Group Discussions (SGD) Materials required: White board/ Black board+Flow chart+Audiovisual aids	120
2.	Personality traits and their impact on the life (Personality traits, academic performance and decision making)		90
3.	Cognitive skills (importance of cognitive skills, basic cognitive skills and ways to improve it)		90
4.	Emotional skills (what is an emotional skill, how to attain emotional competence)		90
5.	Interpersonal and behavioural skills (interpersonal effectiveness and communication skills)		90
6.	Problem-solving skills (how to develop PS skills and the importance of openness, flexibility and empathy in PS)		90
7.	Conflict management (strategies to manage conflict and performing best practices in the medical profession)		90
8.	Closing meetings with individuals/ Small groups (as needed)		45
9.	Evaluation		45
10.	Closure		50

[Table/Fig-2]: Details of intervention plan.

be in non interventional group. The metacognitive and emotional intervention will be conducted after filling BFPT questionnaire, metacognitive awareness inventory, EIQ, PIQ and then pre and post interventional scores of the interventional and non interventional group will be compared to see the effect of intervention.

**Primary outcomes:**

- Using anthropometry as a biomarker for predicting personality and improving the chosen behaviour that is metacognitive and emotional skills of medical students.
- Associating personal information and personality scores and identifying its effect on metacognitive and emotional skills.
- Metacognitive and emotional intervention will help to see the change in traits of personality scores with effect on metacognitive and emotional skills.

**Secondary outcome:** The study would be useful in behavioural medicine to understand the criminal and offensive nature of an individual. The findings will be helpful for identifying the pros and cons of an individual.

**STATISTICAL ANALYSIS**

For the purpose of quantitative data analysis, first a suitable data entry module in the coded form will be created for its rapid computerisation. Quantitative method of data collection would be on questionnaire basis as (PIQ, BFPT, metacognitive awareness inventory and emotional intelligence self-assessment questionnaire) and craniofacial anthropometric measurement basis. Collected data will be entered in Microsoft excel. The MS excel data sheet will be exported to Statistical Package for the Social Sciences (SPSS) trial version 16.0 and the grouping of values will be made into meaningful, dichotomous, nominal, ordinal, ratio, interval categories following the scientific logic and accordingly these will numerically coded. The whole analysis procedure will be carried out by SPSS trial version 16.0. After cleaning the data for any errors, descriptive statistics will be used to explore sample characteristics, relevant statistical methods such as measures of central tendency, dispersion (variability), cross tabulations, correlation and inferential statistics such as t-test, Analysis of Variance (ANOVA), Multivariate Analysis of Covariance (MANCOVA), chi-square, multiple regression and

linear regression methods will be used to understand relationships between the study variables.

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