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Research Article

Identification of A Novel Anthropometric Indices Correlating Aggression: A Case Study Based On Extremes Of Bengal

Dr. Titlee Majumder*[1], Dr. Subrata Ghosh[2]

[1]*Department of Medical laboratory technology, School of Allied Health sciences, Swami Vivekananda University, Barrackpore, West Bengal, 700121
[2]Department of physiology, Hooghly Mohsin College, Burdwan University, Chinsurah, Hooghly, Pin:712101

***Corresponding Author:** Titlee Majumder
*Email: titleem@svu.ac.in

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ABSTRACT

Aggression is a kind of behavior that ensures some of the characters like anger, hostility, physical aggression and verbal aggression. Children at the age of post adolescence used to show variety of these characters within them. Anthropometry shows the body dimensions and is hugely instrumental in many fields of scientific researches. Aggression is very common to all, whereas identification of it is still under research for in-vitro and in-vivo experimentations. A study conducted at different localities of Barrack pore West Bengal upon 150 school going adolescent children within (11 to 14) years age group. Some of the experimental parameters like physiological, anthropometric and a questionnaire have been performed upon them to identify the traits of aggression, like out of four aggression parameters like anger, hostility, physical aggression and verbal aggression which one is predominant and Pearson's correlation is performed to find the anthropometric markers that are correlating with the aggression score. Results showed that fWHR (i.e. face width to height ratio) is sounder to correlate physical amongst the boys than that of the girls, whereas, 2D/4D ratio is found to be highly correlating with mean hostility score amongst the girls of the same age group than that of the boys. The identified novel anthropometric markers can be more easy & painless to measure with in any subject of this particular age group, henceforth to be easier in identifying aggressiveness to build a cruel-free nation.

Keywords: Aggression, facial Width to Height Ratio (fWHR), Palm Indices, Anthropometry, Cognitive Ergonomics

Introduction

Aggression is a kind of behavior that ensures some of the characters like anger, hostility, physical aggression and verbal aggression. Children at the age of post adolescence used to show variety of these characters within them. Anthropometry shows the body dimensions and is hugely instrumental in many fields of scientific researches. Aggression is very common to all, whereas identification of it is still under research for in-vitro and in-vivo experimentations. Facial anthropometry has shown many evidences on this regard. Cognitive ergonomics deals with the psychological settlements of human to the environment where he/she is staying and being groomed. So, various psychological tools in assessment of stress or its expressions are widely acknowledged in the study of behavioral sciences.

Now these days facial width to height ratio at every population and every age group have showed remarkable symmetry on hyper as well as hypo secretions of steroidal hormone like testosterone. Similarly 2D/4D ratio is also showing the same values for many years in identification of aggression and considered as one of the genuine markers for it. In a study of Wang and *et.al* have showed that, 16 characteristic traits of an individual can be identified by facial Width to Height Ratio (fWHR) within a population of 18 to 30 years. Even the mandibular angles are very important among female subjects to alter the average width of the face and

changing the facial width to height ratio accordingly (Wang, 2022). In another study also it has been found that the fWHR is more eligible in correlating aggression among the babies than that of the adults and can be said as more relevant than 2D/4D ratio (Zebrowitz, 2015). Another research has showed that violence within the intimate partners were also be detected by fWHR. Greater width of face once again increase the ratio of fWHR more than 1.83(SD=0.24) amongst the male partners of the relation leads to show tendencies of random domestic violence (Ludan, 2022). The study of Majumder and et al upon the athletic and non-athletic subjects it has been showed that aggression among the non-athletic children can be correlated with fWHR, but children who plays volley do not found any correlations within fWHR and aggression (Majumder, 2018). In another study it has been observed that no such strong evidences are observed which are showing direct correlations between fWHR and aggression but may be in depth research may draw many more aspects of it in assessment of behavior (Liu, 2015).

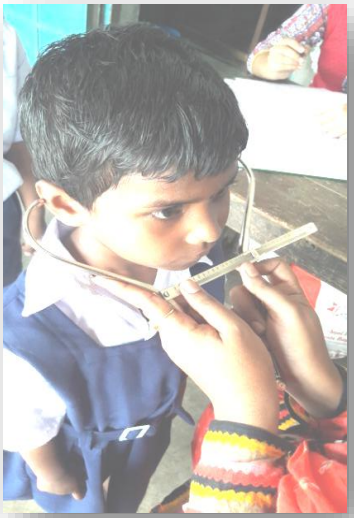


Fig 1: Measuring Facial width.

A study depicts that facial width to height ratio has a huge impact upon the social judgments even males have higher fWHR ratio than that of females for adult population (Stephanie, 2022). The other study revealed that the upper parts of the face are preferentially larger among the adult population denoting the aggression amongst the individual (Shawn, 2015). The cross sectional study of Goetz and et.al had shown that fWHR is a robust predictor of aggression that depicts low to moderate changes in the face dimensions can be the key predictors of aggressiveness (Goetz, 2013). Amongst the juvenile population the face width to height ratio has been found extremely instrumental for the girls' population than that of the boys. Future research may add more references to it (Jessica, 2021). The findings of a prenatal survey in comparison to the teenage population showed an assertion that pubertal testosterone can be determined not directly by fWHR, whereas the other anthropometric determinations are more vivid, for example few of the palm indices (Gülcen, 2021). Though the sexual dimorphism is not associated with the testosterone directly but may underlie many facts that the level of testosterone is partially related to the facial width so as the facial height to width ratio varies accordingly, more studies in this regard are yet to be analyzed (Lefevre, 2013).

Very few researches are found in Bengal suburbs in assessing the aggression among the children, as the importance and awareness of such subjects are neglected in many ways. Especially the biochemical markers which are comparatively easy to assess amongst the adults, are difficult to assess in the children required to be recognized through specific exogenous anthropometric markers. This cross sectional study have emphasized upon the identification of those exogenous markers to assess aggression among the children at least in this part of the world. Aims of the study are as follows:

- To find out whether the aggression scores are correlating and facial anthropometric derivatives or not.
- To find out the correlation between aggression and fWHR.
- To find out the correlation between aggression and 2D/4D ratio.

Materials and Methods

The following cross sectional study was performed in the semi urban parts of the North 24 parganas, Nadia and Hooghly. The places were selected depending upon the distances which could be easy to reach and cost effective. Four different schools were selected from those places as the researchers had approached nearly 7 schools. All the schools are either govt. or govt. aided in nature. With the written consent of the school authority students of intermediate age group (i.e. 10 to 14) years had been selected at first and then depending upon the inclusion criteria they were asked to participate in the study with their parents' verbal or written consent. The groups of boys and girls are segregated and the collected data are compared accordingly. Finally considering the inclusion criteria* about 246 students from the four different schools were selected out of which 116 students were girls. A set of physical, anthropometric, physiological and survey based data** were taken and analyzed statistically with the Minitab 18 software. For comparison two sample t-test were done and Pearson's correlation was done for correlating parameters. The study was performed following the ethical norms of **ICMR Ref: HMC/IEC/SG/05.**

*Inclusion Criteria

1. The subjects are must be within the age group of 10 to 14 years.
2. They must be physically fit and are regular to their respective classes.
3. Parent's informed consent were mandatory
4. They should not take any medicines on regular basis, rather must not possess any medical history.

**Factors to be assessed

Table I: Parameters assessed (physiological and anthropometric parameter)

Sl. No.	Name of the measured parameters	Measuring tool (instrument and formula based)	Unit of measurement
12	Height	Anthropometric rod	Cm
3	Weight	Digital weighing Machine	Cm
4	BMI	Weight / (height)^2	Kg/m^2
5	PI	Weight / (height)^3	Kg/m^3
6	Neck Circumference	Tape	Cm
7	Hip Circumference	Tape	Cm
8	Waist Circumference	Tape	Cm
9	Waist Hip Ratio	Waist circumference/Hip circumference	Nil
10	2D/4D ratio (second and fourth digit ratio)	Second digit/fourth digit	Nil
11	Facial width to height ratio (fWHR)	Facial width/facial height	Nil
12	BPAQ score	Questionnaire based	Nil

Table II: Parameters assessed by revised Buss and Perry aggression Questionnaire: (Buss & Perry, 1992)

Sl No.	Psychological parameters used	Normal range for boys	Normal range for girls
1	Anger	17	16.7
2	Hostility	21.3	20.2
3	Physical aggression	24.3	17.9
4	Verbal Aggression	15.2	13.5

Results and Discussions

After the comprehensive statistical analysis it has been observed that the anthropometric parameters measured amongst the boys and the girls are following the normal growth spurt. At the intermediate age there are many anthropometric dimensions present which may not be identified but can be said as the key markers for the growth spurt. Even changes in facial expressions can be also determined with those markers. Whether they are exogenous indicators for the aggression or not are yet to be researched and confirmed. The major outcomes of the performed cross sectional study are as follows:

a. **Results obtained from two sample t test:** After comparing and correlating the mean scores of parameters it was observed that no such scores irrespective of facial width to height ratio have been found significantly higher amongst the boys of the age group 10 to 14 years than that of girls.

b. **Results obtained from Pearson's correlation:** Another observation showed that fWHR is sounder to correlate physical aggression amongst the boys, whereas 2D/4D is found to be highly correlating with mean hostility score amongst the girls of the same age group than that of the boys.

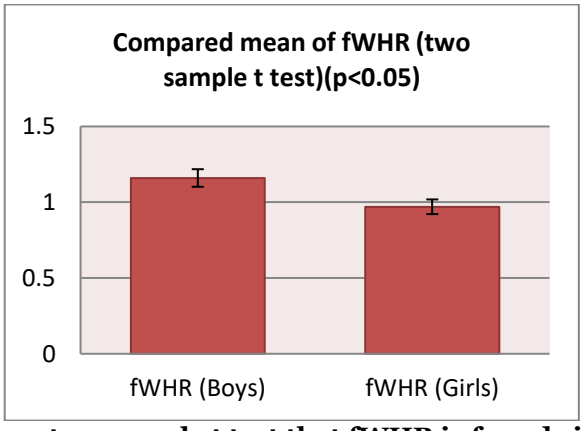
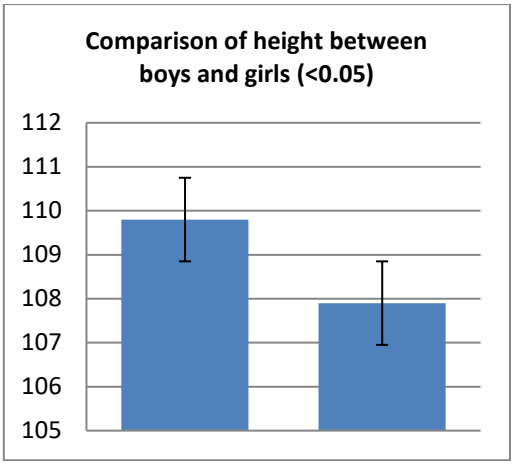


Fig 2: Results obtained from two sample t test that fWHR is found significantly higher in boys than that of girls.

The other set of data are not significantly different from each other on the basis of gender, like height, weight, BMI, PI, Neck circumference, waist circumference, hip circumference waist - hip ratio and 2D/4D ratio at this particular population, which means a kind of linearity is observed in the growth spurt amongst the boys as well as girls at this particular age group. The level of significance is considered as less than equal to ±0.05 for all the parametric mean of both the groups.



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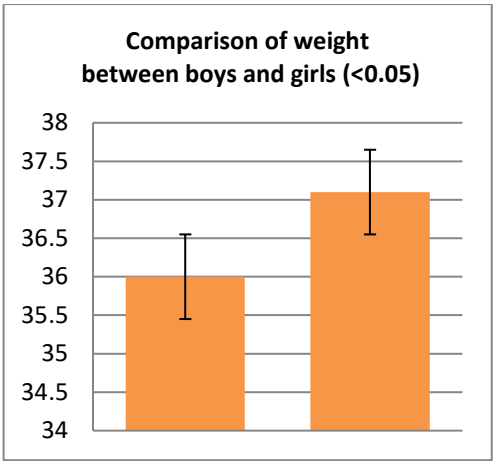

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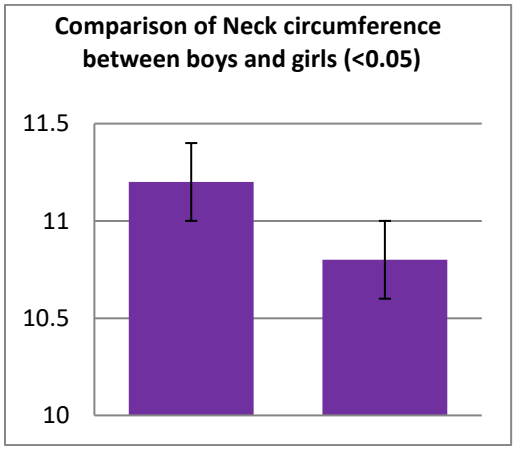

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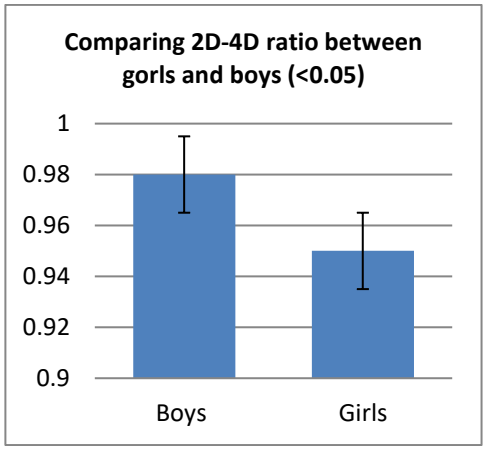

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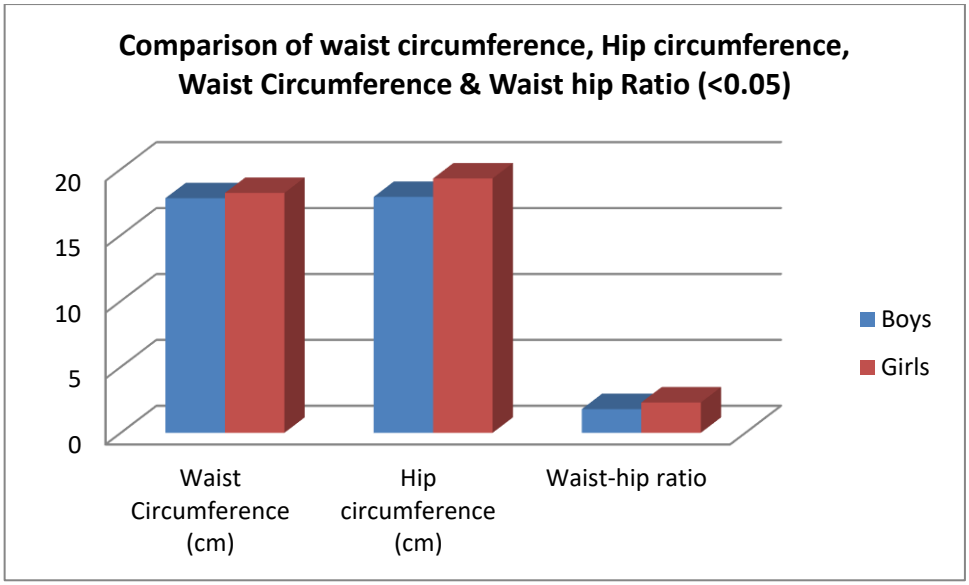

Figure 7: It has been observed from the two sample t test that waist and hip circumference along with its ratio are not found significantly different between the girls and boys at p<0.05.

Figure number 3 shows that the height is found to be higher amongst the boys than that of the girls but the parametric means are not significant to support the differences. Figure number 4 shows that the mean weight of the girls is higher than the boys but not significant at 0.05 level of p value. Figure number 5 & 6 also showed that neck circumference and 2D/4D ratio is found to be higher in boys than that of girls but not in significant manner.

Lastly figure 7 shows that the three parameters like waist circumference, hip circumference and waist hip ratio are different amongst the boys and girls but no such significance at p value 0.05 is observed amongst them. So from the above statistical analysis helps to draw a hypothesis that may be these physical

anthropometric dimensions are not so sound to draw a differentiation in the growth spurt of the population rather can be said as that the growth remains similar in boys and girls at intermediate age.

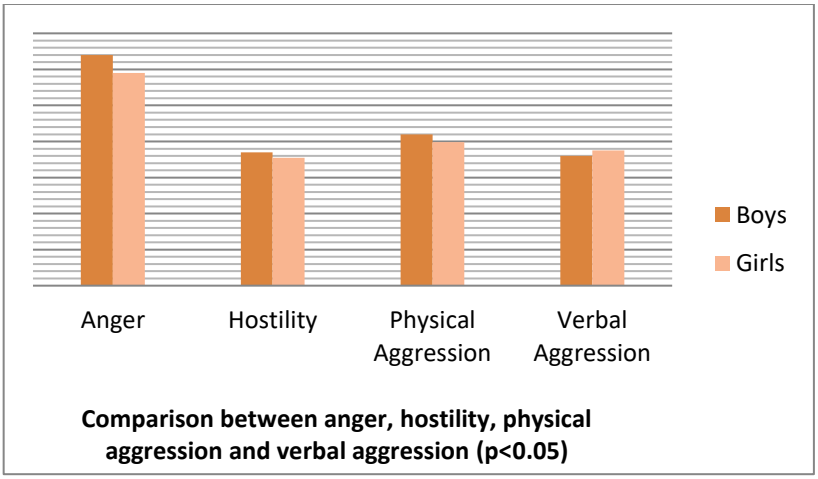

Figure: 8

Buss & Perry questionnaire is a five point scale questionnaire where the subjects will have to answer for 29 questions and each question is ranged from 0 to 4.the zero defines that the trait which explains about the asked question is not characteristic to the subject. Similarly the 4 describes that the asked question is extremely characteristic to the subject.
Pattern of scoring in Revised Buss & Perry Aggression questionnaire (Buss & Perry, 1992):
1- ***Extremely uncharacteistic of me.***
2- ***Somewhat uncharacteristic to me.***
3- ***Neither characteristic nor uncharacteristic of me.***
4- ***Somewhat characteristic to me.***
5- ***Extremely characteristics to me.***

From the revised Buss-Perry aggression questionnaire scores (Figure No : 8) the four different components showed results like anger hostility and physical aggression are higher amongst the boys but the verbal aggression is higher amongst the girls. Whereas, the scores are not found significantly different from the parametric means of both

Table II: Results obtained from Pearson's correlation

Parameters correlated	Gender	Unit	p value	Level of significance
fWHR and physical aggression	Boys (10-14 years)	Nil	±0.03	±0.05
2D/4D ratio and hostility score	Girls (10-14 years)	Nil	±0.019	±0.05

All the measured parameters were correlated by Pearson's Correlation where it have been observed that the facial width to height ratio is found to be significantly correlated with physical aggression amongst the boys and the second and fourth digit ratio is found to be significantly correlated with hostility scores amongst the girls. Other than these two parameters no such other anthropometric parameters are found significantly correlated with the parameters of Buss & Perry aggression questionnaire.
From the above observations it can be said that facial width to height ratio is a potent facial anthropometric marker with which behavioural analysis can be done at least for the intermediate age group. The research had objectified that there was a significant correlation found between second and fourth digit ratio and hostility score of BPAQ amongst the girls. Whereas the group of boys had not showed such level of significance, but showed significant correlations between fWHR and physical aggression (MacDonell, 2017). The two sample t test showed that the mean facial width to height ratio is significantly higher amongst the boys than that of the girls. Facial metrics are always very much relevant in understanding every kind of behavioral gestures rather found instrumental with the palm indices i.e. 2D/4D ratio very dominantly. As it was already established that the ration of second and fourth digit of right hand amongst the boys and same ratio of the left hand amongst the girls are extremely rigid in recognizing higher androgenous hormone levels like testosterone, which is responsible for hyper kinetic behavior more precisely for aggression.
Children from their early at growth spurt is very much sensitive to every physiological, social, behavioural & biochemical factors and changes in any of these factors may lead to cause vulnerability in future upbringings. Especially in post adolescence, which is the phase where the physiological, psychological and behavioral attributes change very rapidly. So identification of these changes is highly required in nurturing them at very

early stage. Many relevant studies have been found in this regard but implementation of interventions in societal upliftment is still very poor. Healthy environment & caring atmosphere may cultivate kindness amongst these younger generations but mal grooming may lead to drive them in the world of violence and cruelty (Zheng, 2022). There are many researchers found where various types of interventions are implemented to prevent cruelty amongst this population, like various food supplements for a particular period of time may lower the tendencies of violence. For example vitamin B complex and Vitamin D are few of those (Fernando, 2008). Role of Alpha-lipoic acid in this context is also very useful. Certain dose of alpha-lipoic acid was administered in the children to lower the tendencies of hyperkinetic behavior as it was hypothesized that, this amount of dosage may alter cell signaling pathways and leads to release many neurotransmitters which are responsible in lowering anxiety, stress and depression (Peterson, *et.al*, 2008). Even the patients of acanthosis can be also treated with care and various psychological as well as dietary intervention so that their disease related anxiety, depression and trauma can be cured (Prakash, *et.al,* 2020). Population of higher finger digit ratio showed immense dis organization within in their behavior and treated with extracurricular activities for learning sportsmanship and sharing (Werner, *et al*, 2016). Cognitive behavioral therapy and parent management training can be also benefitting for counseling students and character building, especially those who are extremely hyperkinetic in nature (Denis, *et.al*, 2016). Similarly in another study it has been portrayed that with drawing attention from the unwanted behavior and giving less importance to the indiscipline attitude rather praising the desirable attitude makes an individual psychologically healthy and less violent (Julia, *et.al*, 2020). Pediatric irritability is a challenge and this irritation grows due to giving lack of positive stimulus to the brain. With the help of numerous therapies relating cognitive ergonomics like cognitive behavioral training (CBT) and many more artificial intelligence based tools have been implemented in lowering aggression amongst the youth population (Kircanski, *et.al*, 2019).

Conclusion

More researches upon these exogenous markers like facial anthropometry, physical anthropometry and questionnaire survey correlating biochemical markers can be the strongest weapons in developing some novel indicators of aggression. However irrespective of numerous proved endogenous markers which are easier to recognize from serum samples and saliva samples but age restrictions are very predominant in identifying this markers, so with the help of non-invasive markers it will be more helpful to identify cruelty amongst the children at least in this part of the world. Children of pre as well as post adolescence must be treated with love and care irrespective of any stringency can lead to form a healthy human kingdom.

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