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Finger digit ratio: predicting aggression amongst school children of biphasic growth in Eastern part of West Bengal.

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***Abstract*:** *The elevated global trend of terrorism needs to be smothered at childhood. Scientists are investigating for correlation between aggressiveness, pre-social personality traits, second digit & fourth digit ratio and prenatal androgen activity.*
Methods & Results: *144 children of 9-12 years are chosen randomly including 48 girls (9-11years). These samples were properly (age-wise) classified and grouped to assess all anthropometric and cognitive data. Verbal aggression and hostility of senior boys are found significantly correlated with their palm length and fourth digit length (4D); similarly for junior boys, second digit length (2D) and Palm height are found significantly correlated with height & physical aggression. Statistical analysis showed that Palm thickness, 2D & 4D length and 2D-4D ratio are significantly higher in pre pubertal girls than boys.*
Conclusion & Interpretation: *Early age show correlations in different anthropometric and cognitive parameters with their growing years in boys, but not in girls of similar primary age. Still girls at the same primary age contain higher values of same anthropometric dimensions than boys, but prevalence of cruelty is much vigorous in boys than that of girls. This ill fate of humanity needed to be treated at early age with love, care, affection and hospitality to come out with terror free nation.*
Keywords: *Aggression, Androgen, Anthropometry, Ergonomics, Pearson's correlation.*

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I. Introduction

Aggression is a summation of various behavioral patterns like anger, hostility, hyper-sensation and emotional vulnerability. People who are aggressive in nature are prior to cause harm for oneself, others sometimes in a broader dimension, to nation. Their nature of so called aggression breed up within them to be in the peak of violence and vulgarity, sometimes groomed in the form of terroristic attitudes, which is a major developing issue globally now these days. It needs to be checked rather corrected at different stages of life from birth to next. Whereas children are the future of the nation and all the goodness should come along with their increasing age, if they are properly nurtured, but lack of love, fraternity, social practices and spirit of togetherness leads up bring some violent attitudes in them. Such terroristic attitudes are required to be smothered at the budding stage to maintain global peace and calm.

Considering the social commitments, scientific researches, most of the times have been given its priority in the light of present day need and requirement. Ergonomic researches are changing vastly over the decades to shape up and open newer frontiers. This piece of study is mainly based on 2D:4D ratio which is a ratio of second digit and fourth digit fingers of palm and may open up some newer dimensions to find out the predictive biomarker of aggression i.e. non invasive and easy assessable as well. From the previous researches several facts had been observed, for e.g. various personality traits, including aggressiveness and sensation seeking, have been hypothesized to be influenced by pre-natal androgen exposure, which is evident [1]. Scientists also studied, whether individual differences in age, gender, race can relate aggressiveness, hyper-sensation and several pre-social personality traits with 2D:4D ratio, and concluded to be the major biomarker, anthropometrically of such cognitive parameters. They also drew direct and indirect correlations between other palm dimensions, anthropometric parameters to judge the predictive sign of aggressive behavior, which includes Physical Aggression, Verbal aggression, Hostility & Anger (which are the cognitive dimensions that come in Buss & Perry Aggression scale)[2].

Fig-1: measuring 2D length.

Aggression is thought to be mediated, by prenatal testosterone (T) exposure. Excessive T exposure during ontogeny can modulate adult physiology and behavior [3]. 2D:4D ratio of less than one is correlated with increased spatial ability. 2D:4D is a valuable tool in the study of the determining individual differences [4]. Moreover, extreme T exposure during ontogeny may lead to congenital adrenal hyperplasia (CAH) [5] & females with CAH have lower 2D:4D ratio than males who are not suffering from CAH [6]. These evidences suggest that excessive T exposure can result in lower 2D:4D ratio and vulnerable behavior [7]. Some studies show that higher androgen/estrogen ratios in amniotic fluid, obtained prenatally, were associated with lower 2D:4D ratios of the individuals measured at age of two, in both the sexes [8].

II. Aims And Objectives:

Present study has been undertaken to fulfill the following objectives:

1. To find out the correlation between 2D:4D ratio and cognitive skill of early school children.
2. To find out whether primary growth spurt and post primary growth spurt imposed any observable effect on 2D:4D ratio of children or not.
3. Whether 2D:4D ratio in relation to head breadth and entire palm dimension, do impose any significant correlation among age groups and genders; if so what would be the possible outcome of such correlation.
4. Most importantly, whether any of the anthropometric parameters may correlate with the aggression scores of children and can that parameter be utilized as novel eye-opener of judging terroristic attitude.

III. Materials And Methods

3.1 Collection and analysis of human samples

This study was performed following the human ethical guideline of Institutional ethical committee (Human), Hooghly Mohsin College, Government of West Bengal as per ICMR, (GOI) directions. 96 male and 48 female students of 4 different schools were randomly chosen for this double blind study of Kolkata, West Bengal.

Fig- 2: measuring palm breadth

All the students were debarred from taking any medicines from 3 months before and during this experiment. Permission from all the teachers and guardians was taken, so that their children could participate. All the students were classified into three groups; (group-1) boys of 9 and 10 years, (group-2) boys of 11-12 years, whereas (group-3) girls of 9-11 years were placed accordingly in a single group. All the collected data of the following groups were compared statistically like; data of group 1 was compared with group 2 to find out

significant differences between the parameters of primary and post primary growth spurt. On the other hand group 1 was again compared to group 3, to analyze whether gender differences imposed any significant changes in both the similar age groups or not. Subsequently all the anthropometric and cognitive data of above groups were correlated to each other in same orientation as compared. Result and conclusions were drawn accordingly.

Fig-3: measuring palm thickness

3.2 Study design: Questionnaire was performed on the subjects to get the aggression score and identify the aggressive individuals on the basis of 4 factors namely, Physical Aggression (PA), Verbal Aggression (VA), Anger (A) and Hostility (H)***:{ ref- Buss, A.H., & Perry, M. (1992)***[2]**.** After that the statistical analysis was performed on all the body parameters and palm dimensions to find out the comparison and correlation of anthropometric data with the cognitive data by data generated method of statistical software, minitab-17 for windows version 2009-10, considering p value ≤ 0.05. Assessed parameters are mentioned in the following Table 1 & Table 2.

Table 1: Assessment of Physical Parameters

Sl. No	Parameter assessed	Testing method
1	Age (year)	Questionnaire method and data book of School authority.
2	Height (cm)	Anthropometric Rod.
3	Weight(kg)	Weight machine.
4	B.M.I. & PI from height and weight.	Jamar Plus Hand Grip dynamometer (Digital) USA.
5	Hand grip strength (kg)	

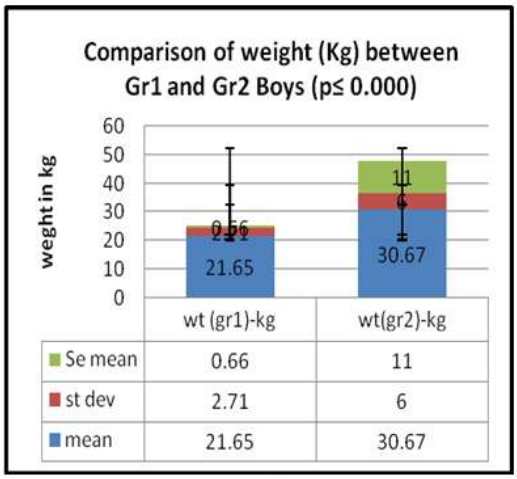
Table 2: Assessment of Palm dimensions

Sl. no	Parameter assessed	Testing method
1	Length of 2D (index finger) in cm	Digital Slide calipers
2	Length of 4D (ring finger) in cm	Digital Slide calipers
3	2D:4D ratio	Calculated
4	Palm length (cm)	Spreading calipers.
5	Palm breadth(cm)	Spreading calipers.
6	Palm thickness (cm)	Spreading calipers.
7	Head circumference(cm)	Spreading calipers.

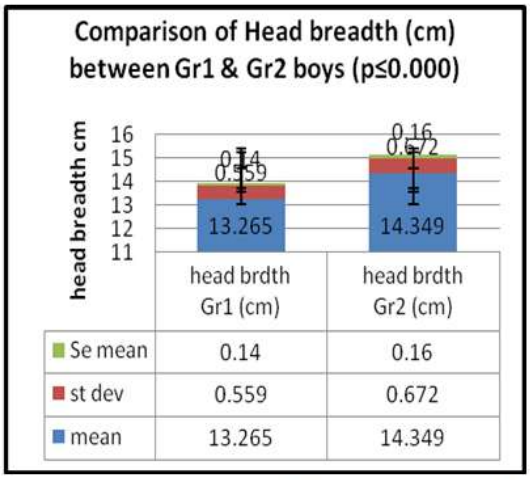
IV. Result And Discussion

There are some interesting results observed from the following study, which is described underneath in the mode of graphical representation. From two tail t test it is observed that some of the anthropometric parameters (weight, head breadth, second digit length, fourth digit length & second digit- fourth digit ratio) amongst group 1 and group 2 boys are significantly different from each other , whereas there are no changes observed in the aggression scores. Similarly comparison between girls and boys of same age group (group 1 & group 3) reveals no change in behavioral patterns except some of the anthropometric dimensions like second digit length, fourth digit length, second digit and fourth digit ratio along with palm thickness. In all the cases p value <0.05 is considered to be significant.

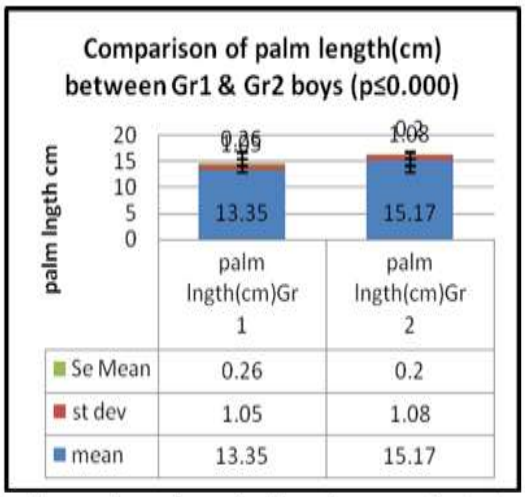
4.1 Bar diagrams show significant changes of group 1 & group 2 data after comparing them by two sample t test.



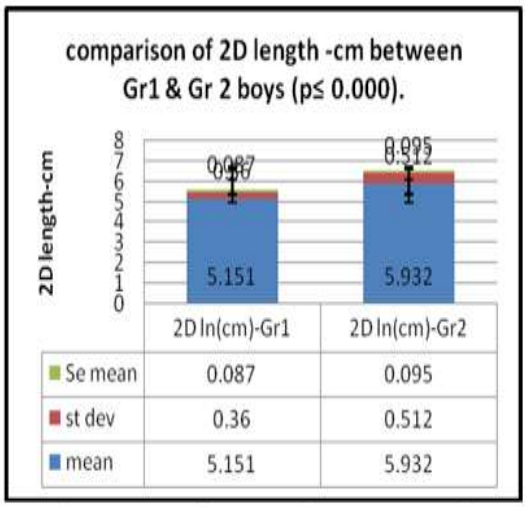
Bar diagram 1, confirms significant increase of weight Of group 2 boys than that of group 1boys, where p=0.000.



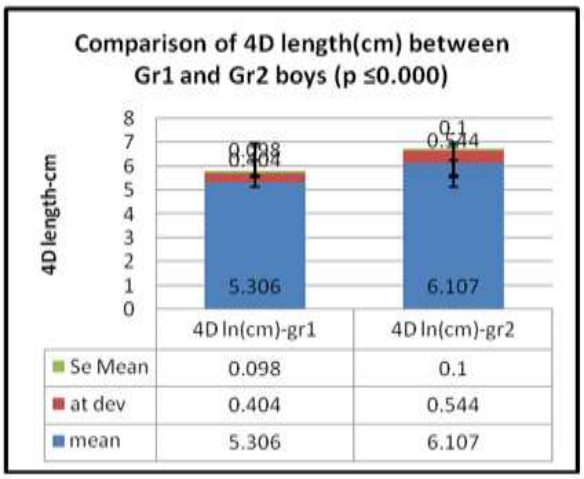
Bar diagram 2, confirms significant increase of head breadth of group 2 boys than that of group 1boys, where p=0.000.



Bar diagram 3, confirms significant increase of palm length of group 2 boys than that of group 1boys, where p=0.000.

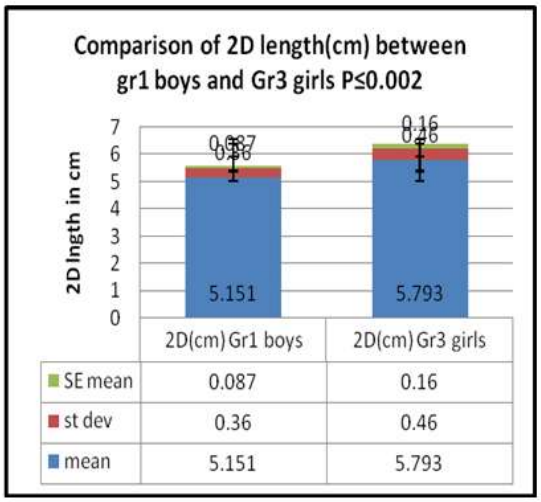


Bar diagram 4, confirms significant increase of second digit length of group 2 boys than that of group 1boys, where p=0.000.

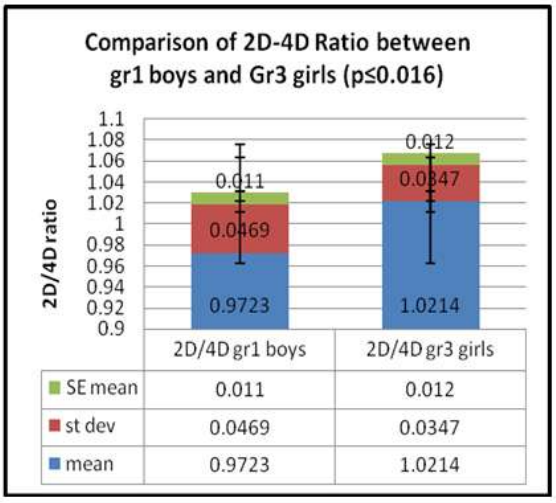


Bar diagram 5, confirms significant increase of fourth digit length of group 2 boys than that of group 1boys, where p=0.000.

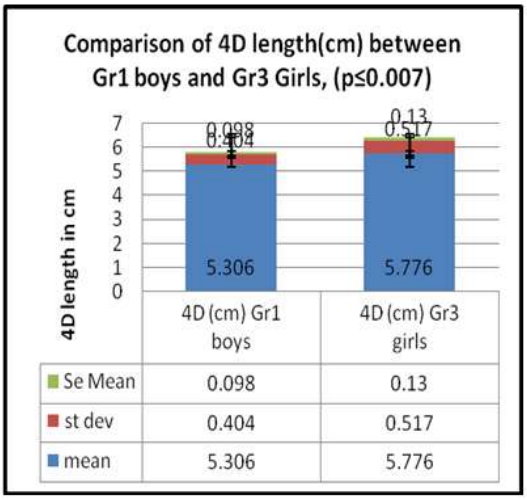
4.2 Bar diagrams show significant changes of group 1 & group 3 data after comparing them by two sample t test.



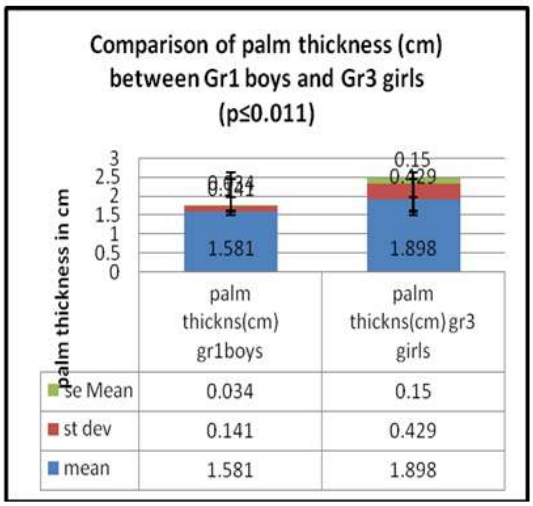
Bar diagram 6, confirms significant increase of second digit length of group 3 girls, than that of group 1boys, where p≤0.002.



Bar diagram 7, confirms significant increase of second digit- fourth digit ratio of group 3 girls than that of group 1boys, where p≤0.016.



Bar diagram 8, confirms significant increase of fourth digit length of group 3 girls than that of group 1boys, where p≤0.007.



Bar diagram 9, confirms significant increase of palm thickness of group 3 girls than that of group 1boys, where p≤0.011.

Usually biphasic growth symbolizes increase in the value of parameters like weight, 2D length, 4D length, head breadth and palm length from primary to secondary growth spurt, in contrast, gender difference also creates changes in some anthropometric parameters like 2D length, 4D length, 2D/4D ratio & palm thickness amongst boys and girls at an identical age, which may be unusual in nature. There are no such noticeable changes promoted in the behavior of biphasic growth and gender specific growth containing children that are assessed statistically at least in this part of West Bengal. Previous researches support the fact that value of 2D/4D ratio symbolizes the behavioral changes in individual. Lower the values, higher the rate of irrational/vulnerable behavior [9], [10]**.** Whereas other anthropometric markers whether have any specific roles in the identification of aggressive behavior or not is yet to be established. In this study some aggression scores of BPAQ scale showed significant correlation with the anthropometric parameters of the respective age group which are as follows -

- Among all assessed anthropometric parameters palm length of secondary age group boys (11-12years) are found to be significantly correlated with the verbal aggression ($p<0.036$), where as hostility score of the same age group is significantly correlated with 4D lengths ($p<0.044$).

- At primary age of boys the palm height is found to be significantly correlated with the cognitive parameter named physical aggression ($p<0.029$) excluding other two groups.

Girls at this stage of primary growth do not show any significant correlation between anthropometric & cognitive parameters. As the double blind study was performed with lesser number of subjects, no regression equation could be drawn properly, but 2D:4D ratio (the predictor) on BMI (the response variable) has been estimated to be low of i.e. (1) **1.07 - 0.0067 of 9-11years** on the basis of the data**.** The coefficient value 0.0067 of BMI; is really very small and so it is constant (i.e., the intercept) at 1.07 which is found to be statistically significant that appears from its p-value (viz.0.000).

V. Conclusion

Growing age not only promotes the variability in body dimensions but also triggers up some of the other psychological characteristics among the children. Primary & post primary boys show different signs of aggression which may be predictable in biochemical as well as anthropometric ways. Changes in the different palm dimensions may be concluded as significant predictor of several aggressive patterns at least in this part of the world. Parameter which shows remarkable correlation at primary age may not be significantly correlated with each other at post primary age, but the early signs are observable and significant to flourish the aggression on later age. Girls, the future mother of our nation do not show any significant correlation with such aggression scores, instead of having higher values of those assessed anthropometric parameters than boys at the same age, which enlighten much kinder, sympathetic and loving site of nature in them. There is a long debate whether gene or external environment-----which is more important factors for promoting such aggressive behavior! However these predictable anthropometric markers can be eye-opener for finding newer and more relevant predictors of aggression.

Acknowledgement

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