

A Study on The Relationship Between 2D:4D Digit Ratio and Aggression Among Individuals

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Abstract—As interest in understanding the biological basis of human behaviour continues to grow, the relationship between physical traits and aggression has gained attention. This study explores whether the 2D:4D digit ratio, a biological marker linked to prenatal hormonal exposure, has a significant association with aggression among individuals. Although such biological indicators are often considered influential, the findings suggest that aggression may not be directly determined by them.

The study was conducted among 120 participants, including both males and females. Measurements of the index (2D) and ring (4D) fingers were taken to calculate the digit ratio, and aggression levels were assessed using a structured questionnaire. The collected data were analysed using basic statistical tools such as mean, standard deviation, and correlation.

The results showed that the average aggression level among participants was moderate, with a mean score of 30.77 and a standard deviation of 7.31. The correlation between 2D:4D ratio and aggression was found to be very weak and negative ($r = -0.078$), indicating no meaningful relationship between the two variables. Additionally, aggression levels were found to be nearly equal among male and female participants.

The findings suggest that aggression is influenced more by psychological, social, and environmental factors rather than biological traits alone. The study highlights the need to consider multiple dimensions when examining human behaviour and provides useful insights for future research in behavioural science and forensic studies.

Index Terms—2D:4D ratio, aggression, digit ratio, behavioural traits, biological factors.

I. INTRODUCTION

Aggression is a fundamental aspect of human behaviour that can manifest in various forms, ranging from verbal hostility to physical violence. It is influenced by a complex interaction of biological,

psychological, and environmental factors. In fields such as forensic science and behavioural psychology, understanding the causes and patterns of aggression is essential for prevention, assessment, and intervention. As society continues to explore the roots of human behaviour, increasing attention has been given to identifying measurable biological indicators that may be associated with aggression.

One such biological marker is the 2D:4D digit ratio, which refers to the proportional length of the index finger (second digit) to the ring finger (fourth digit). This ratio is considered an indirect indicator of prenatal hormonal exposure, particularly testosterone and oestrogen. Research suggests that individuals with a lower 2D:4D ratio may have been exposed to higher levels of testosterone in the womb, which has been linked to traits such as competitiveness, dominance, risk-taking behaviour, and aggression. Due to its non-invasive nature and ease of measurement, the digit ratio has gained importance in behavioural and forensic studies.

The integration of biological markers into behavioural research has opened new avenues for understanding personality traits and tendencies. However, aggression is not solely determined by biological factors. Environmental influences such as upbringing, social interactions, cultural norms, and life experiences also play a significant role in shaping aggressive behaviour. For instance, exposure to violence, stress, peer influence, and emotional regulation skills can significantly impact how aggression is expressed. Therefore, while biological indicators like the 2D:4D ratio may provide insights, they cannot fully explain the complexity of human aggression.

A major challenge in this area of research is the inconsistency of findings across different studies. Some researchers have reported a significant association between digit ratio and aggression,

suggesting that individuals with lower ratios tend to exhibit higher aggressive tendencies. In contrast, other studies have found weak or no significant relationship, indicating that aggression may be influenced more strongly by non-biological factors. These conflicting results highlight the need for further research to better understand the extent to which digit ratio can be considered a reliable predictor of aggression.

In recent years, there has been growing interest in examining gender differences in both digit ratio and aggression. It is generally observed that males tend to have lower 2D:4D ratios compared to females, which is often attributed to higher prenatal testosterone exposure. Similarly, males are often reported to exhibit higher levels of physical aggression, while females may display more indirect or relational forms of aggression. However, these differences are not absolute and may vary depending on social and cultural contexts. Understanding whether such differences exist within specific populations is important for developing a comprehensive understanding of aggression.

Despite the increasing body of research, there remains a lack of localized studies examining the relationship between 2D:4D ratio and aggression, particularly among student populations. Students represent a unique group, as they are exposed to various academic, social, and emotional challenges that may influence their behaviour. Investigating aggression within this group can provide valuable insights into behavioural patterns and contribute to the development of effective strategies for emotional regulation and conflict management.

Furthermore, the study of aggression in relation to biological markers has important implications in forensic science. Identifying potential indicators of aggressive behaviour can aid in criminal profiling, risk assessment, and understanding behavioural tendencies in different contexts. However, it is crucial to approach such findings with caution, as behaviour cannot be predicted solely based on biological characteristics.

In conclusion, aggression is a multifaceted behaviour influenced by a wide range of factors. While the 2D:4D digit ratio offers a promising avenue for exploring the biological basis of aggression, it should be considered as one of many contributing factors. The present study aims to examine the relationship between 2D:4D digit ratio and aggression among individuals, while also exploring potential differences

based on gender. By combining biological measurements with behavioural assessment, this study seeks to contribute to the growing body of knowledge in behavioural science and forensic research.

HYPOTHESIS

- Null Hypothesis (H_0)

There is no significant relationship between the 2D:4D digit ratio and aggression.

- Alternative Hypothesis (H_1)

There is a significant relationship between the 2D:4D digit ratio and aggression.

II. REVIEW OF LITERATURE

1. In a study conducted by Manning et al. (1998), the concept of the 2D:4D digit ratio was introduced as a biological marker linked to prenatal testosterone exposure. The study suggested that individuals with lower digit ratios are likely to have higher prenatal testosterone levels, which may influence behavioural traits such as aggression and dominance.
2. Bailey and Hurd (2005) examined the relationship between digit ratio and aggression among men. The study found that individuals with lower 2D:4D ratios showed higher levels of physical aggression, supporting the hypothesis that prenatal hormonal exposure plays a role in aggressive behaviour.
3. Archer (2006) reviewed the role of testosterone in human aggression and concluded that biological factors, including hormonal influences, contribute to aggressive tendencies. The study highlighted that testosterone is associated with dominance behaviour and competitive aggression.
4. McIntyre et al. (2007) investigated the association between 2D:4D ratio and aggression but reported weak and inconsistent findings. The study suggested that aggression cannot be explained solely by biological markers and that other factors must be considered.
5. Hönekopp and Watson (2010) conducted a meta-analysis to examine the relationship between digit ratio and behavioural traits. The results indicated that while there is some association between 2D:4D ratio and aggression, the effect size is small and varies across different populations.

6. Buss and Perry (1992) developed the Aggression Questionnaire, which measures aggression across multiple dimensions such as physical aggression, verbal aggression, anger, and hostility. This tool has been widely used in research to assess aggression levels in individuals.
7. Bandura (1977), through the Social Learning Theory, emphasized that aggression is learned through observation and imitation. The study highlighted the importance of environmental influences such as family, peers, and media in shaping aggressive behaviour.
8. Book et al. (2001) examined the relationship between testosterone and aggression and found that hormonal levels are linked to aggressive and dominant behaviours, particularly in competitive situations.
9. In a more recent study, Pratt et al. (2016) analysed biological and environmental influences on aggression and concluded that while biological factors may contribute, environmental and psychological factors play a more significant role in determining aggressive behaviour.
10. Manning (2002) further explored gender differences in digit ratio and reported that males generally have lower 2D:4D ratios compared to females, indicating higher prenatal testosterone exposure. This difference has been associated with variations in behaviour, including aggression.

Overall, the reviewed literature indicates that although there is some evidence supporting a relationship between 2D:4D digit ratio and aggression, the findings are not consistent. Many studies suggest that aggression is a multifactorial behaviour influenced by a combination of biological, psychological, and environmental factors.

III. AIM AND OBJECTIVES

3.1 AIMS

To study the relationship between 2D:4D digit ratio and aggression among individuals.

3.2 OBJECTIVES

- To measure the 2D:4D digit ratio of participants using index and ring finger lengths.
- To assess the level of aggression among participants using a structured questionnaire.

- To analyse the relationship between digit ratio and aggression using statistical methods.
- To compare aggression levels between male and female participants.
- To determine whether 2D:4D ratio can be considered a predictor of aggression

IV. METHODOLOGY

4.1 MATERIALS AND INSTRUMENTS:

The data for the present study were collected through direct measurement and questionnaire methods. The lengths of the index (2D) and ring (4D) fingers were measured using a standard measuring scale (ruler). These measurements were used to calculate the 2D:4D digit ratio for each participant.

Aggression levels were assessed using a structured questionnaire based on a Likert scale, which included statements related to anger, hostility, and aggressive behaviour. Participants were asked to respond using options such as Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree.

The collected data were entered into Microsoft Excel for organization and analysis. The data analysis was carried out using the following techniques:

Descriptive Statistics:

Used to calculate mean and standard deviation of aggression scores to understand the overall trend and variability.

Correlation Analysis:

Pearson's correlation coefficient was used to examine the relationship between 2D:4D digit ratio and aggression levels.

Comparative Analysis:

Gender-based comparison was performed to analyse differences in aggression levels between male and female participants.

These methods helped in understanding the relationship between biological traits and behavioural patterns.

4.2 METHODOLOGY:

Sampling Technique:

The target population for the study consisted of individuals from different age groups and genders.

Participants included students and young adults from various backgrounds.

A total of 120 samples were collected and analysed. The sampling technique used was convenience sampling, where participants were selected based on their availability and willingness to participate.

Although the sampling method was non-random, it was considered appropriate due to time constraints and the exploratory nature of the study.

Data Collection Method:

Data were collected through two main procedures:

1. Physical Measurement:

The lengths of the index (2D) and ring (4D) fingers of participants were measured using a ruler. The 2D:4D ratio was calculated by dividing the length of the index finger by the length of the ring finger.

2. Questionnaire Method:

Aggression levels were assessed using a structured questionnaire consisting of statements related to aggressive thoughts, feelings, and behaviours. Participants responded using a five-point Likert scale.

The questionnaire included items related to:

- Expression of anger
- Verbal aggression
- Emotional reactions
- Behavioural tendencies

All responses were recorded and later converted into numerical values for analysis.

4.3 Ethical Considerations

Ethical principles were strictly followed during the study. Participants were informed about the purpose of the research before data collection. It was clearly ensured that:

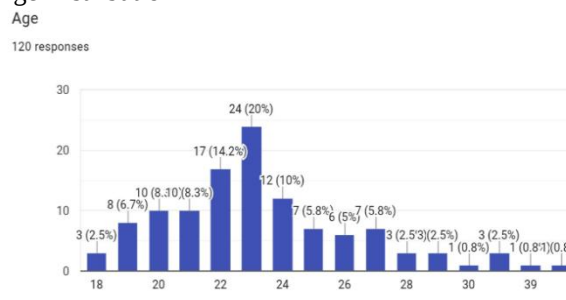
- Participation was voluntary, and participants could withdraw at any time.
- No personal or identifiable information was collected.
- All data were kept confidential and anonymous.
- The collected data were used only for academic purposes.
- Necessary permission was obtained before conducting the study.

V. RESULTS

The present study was conducted on 120 participants to examine the relationship between 2D:4D digit ratio and aggression. The collected data were analysed using descriptive statistics and correlation analysis. The results are presented below.

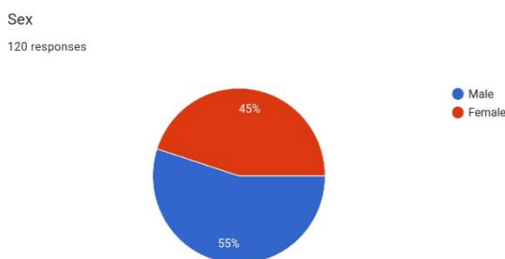
5.1 Demographic Distribution

Age Distribution



The age distribution of participants shows that the majority of individuals fall within the age group of 20–24 years, indicating that most respondents are young adults.

Sex Distribution



Out of 120 participants:

- 55% were male
- 45% were female

This shows a relatively balanced representation of both genders in the study.

5.2 Aggression Questionnaire Analysis

The responses to aggression-related statements were analysed using percentage distribution as shown below:

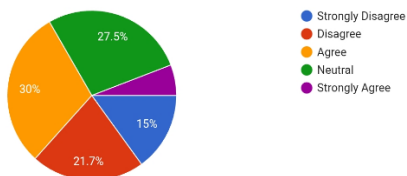
1. I get angry quickly when someone disagrees with me

Majority responses were Agree (30%) and Neutral (27.5%)

Indicates moderate tendency of quick anger.

I get angry quickly when someone disagrees with me.

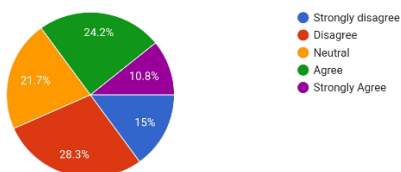
120 responses



2. I sometimes feel the urge to hit someone when I am very angry

I sometimes feel the urge to hit someone when I am very angry.

120 responses



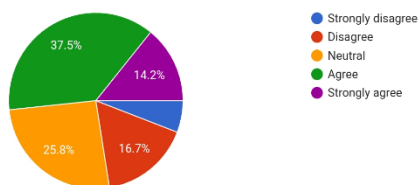
Majority responses were Disagree (28.3%) and Agree (24.2%)

Suggests mixed responses, but physical aggression tendency is moderate.

3. I raise my voice during arguments

I raise my voice during arguments.

120 responses



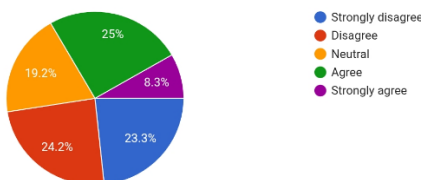
Majority responses were Agree (37.5%)

Indicates common verbal aggression behavior.

4. I think about revenge when someone insults me

I think about revenge when someone insults me.

120 responses



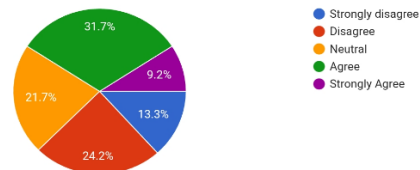
Responses were evenly distributed

Shows variation in emotional reactions among participants.

5. I find it difficult to control my anger

I find it difficult to control my anger.

120 responses



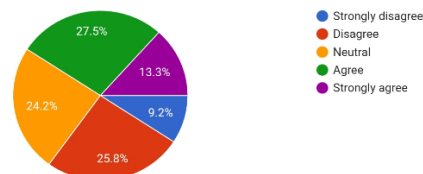
Majority responses were Agree (31.7%)

Indicates moderate difficulty in anger control.

6. I get irritated easily

I get irritated easily

120 responses



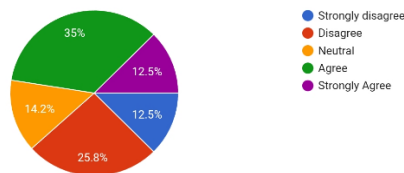
Responses were spread across categories

Suggests variability in irritability levels.

7. I say harsh words when angry

I say harsh words when angry.

120 responses



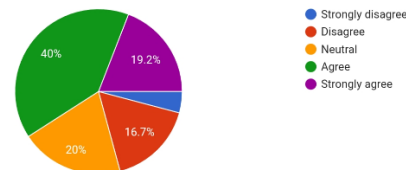
Majority responses were Agree (35%)

Indicates presence of verbal aggression.

8. I feel angry when people treat me unfairly

I feel angry when people treat me unfairly.

120 responses



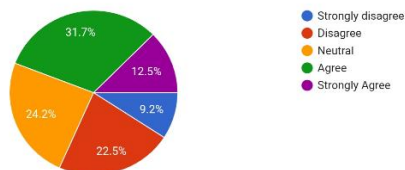
Majority responses were Agree (40%)

Shows strong emotional response to unfair situations.

9. When frustrated, I feel like breaking things

I feel hostile toward people who criticize me.

120 responses



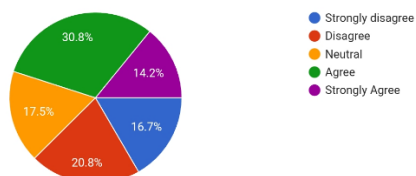
Majority responses were Agree (30.8%)

Indicates moderate frustration-related aggression.

10. I feel hostile toward people who criticize me

When frustrated, I feel like breaking things.

120 responses



Majority responses were Agree (31.7%)

Shows moderate level of hostility.

5.3 Statistical Analysis

- Mean Aggression Score = 30.77
- Standard Deviation = 7.31

Indicates moderate variation in aggression levels among participants.

5.4 Correlation Analysis

The Pearson correlation between 2D:4D ratio and aggression was found to be:

$$r = -0.078$$

This indicates a very weak negative correlation, suggesting no significant relationship between digit ratio and aggression.

5.5 Gender Comparison

Male Mean Aggression = 30.85

Female Mean Aggression = 30.69

The difference is minimal, indicating no significant gender difference.

FINAL RESULT SUMMARY

- Aggression level → Moderate
- Correlation → Very weak (-0.078)
- Gender difference → Not significant

VI. DISCUSSION

The present study aimed to examine the relationship between the 2D:4D digit ratio and aggression among individuals. The findings of the study indicate that aggression is a complex behaviour influenced by multiple factors, and the role of biological markers such as digit ratio appears to be limited.

The analysis of aggression questionnaire responses showed that most participants exhibited moderate levels of aggression. A considerable proportion of participants agreed with statements related to verbal aggression, anger, and emotional responses, such as raising their voice during arguments and feeling angry when treated unfairly. However, responses related to physical aggression, such as the urge to hit or break things, were comparatively lower. This suggests that while emotional and verbal expressions of aggression are common, extreme forms of aggression are less prevalent among the participants.

The statistical analysis revealed that the mean aggression score was 30.77, with a standard deviation of 7.31, indicating moderate variability in aggression levels. This finding suggests that aggression is present to a certain extent among individuals but varies from person to person depending on individual differences and external influences.

One of the key objectives of the study was to examine the relationship between digit ratio and aggression. The results showed a very weak negative correlation ($r = -0.078$) between 2D:4D ratio and aggression. This indicates that there is no significant relationship between the two variables. Although previous studies have suggested that lower digit ratios may be associated with higher aggression due to prenatal testosterone exposure, the present findings do not strongly support this claim. This aligns with several studies that have reported weak or inconsistent relationships between biological markers and behavioural traits.

The comparison between male and female participants showed almost equal levels of aggression, with only a slight difference in mean scores. This suggests that gender does not play a significant role in determining aggression levels in this sample. While some literature reports higher aggression in males, especially physical aggression, the present study indicates that such differences may not always be significant and can vary depending on social and environmental factors.

The findings of this study highlight the importance of considering psychological, social, and environmental influences when studying aggression. Factors such as upbringing, peer influence, stress, and individual personality traits may have a stronger impact on aggressive behaviour than biological characteristics alone. Therefore, relying solely on biological indicators like the 2D:4D ratio may not provide a complete understanding of aggression.

However, the study has certain limitations. The use of convenience sampling and a relatively limited sample size may affect the generalizability of the findings. Additionally, aggression was measured using self-reported questionnaires, which may be influenced by personal bias or social desirability. Future studies can include larger and more diverse samples, as well as additional methods such as behavioural observation or experimental approaches, to obtain more accurate results.

In conclusion, the study suggests that while the 2D:4D digit ratio is an interesting biological marker, it is not a strong predictor of aggression. Aggression is a multifactorial behaviour influenced by a combination of biological, psychological, and environmental factors. Further research is needed to explore these relationships in greater depth and across different populations.

VII. CONCLUSION

The present study was conducted to examine the relationship between the 2D:4D digit ratio and aggression among individuals. Based on the analysis of the collected data, it can be concluded that aggression is a complex behaviour influenced by multiple factors, and the role of biological indicators such as digit ratio is limited.

The results of the study showed that the overall level of aggression among participants was moderate, with some variation between individuals. The statistical analysis revealed a very weak negative correlation ($r = -0.078$) between 2D:4D ratio and aggression, indicating that there is no significant relationship between the two variables. This suggests that digit ratio alone cannot be used as a reliable predictor of aggressive behaviour.

The comparison between male and female participants also showed no significant difference in aggression levels, indicating that gender does not play a major

role in determining aggression within the sample studied.

The findings of this study emphasize that aggression is influenced more by psychological, social, and environmental factors rather than biological traits alone. Factors such as upbringing, social interactions, emotional regulation, and life experiences are likely to have a greater impact on aggressive behaviour.

Although the 2D:4D digit ratio has been widely studied as a biological marker, the present study suggests that its relationship with aggression is minimal. Therefore, it is important to adopt a multidimensional approach when studying human behaviour rather than relying solely on biological indicators.

In conclusion, the study concludes that there is no significant relationship between 2D:4D digit ratio and aggression.

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