

## AGGRESSION AND DIGIT RATIO IN A SAMPLE OF UNIVERSITY STUDENT

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### ABSTRACT

*On a sample of 152 students (21 males and 131 females ) of the graduate course of Psychology at the University of Catania we studied whether the ratio between the length of the second finger and that of the fourth finger of the hand (digit ratio or 2D:4D ratio) is capable of predicting the access to the course and academic success. We also evaluated the level of aggressiveness of our sample since there is a possible correlation between prenatal androgen levels and intensity of aggressiveness in adulthood. The present results confirm the relationship between aggressiveness and digit ratios and support the hypothesis that students with lower digit ratios have improved performance in the admission test, were is important a prompt decision making, but not in exams during the academic year, where planning capabilities seem to play a more significant role. Conversely, the present investigation points out that the level of stress, expressed as TMD, while affects the academic performance of the students does not seem to have played a significant role at the time of admission test.*

**Key words:** Stress, aggression, university student, anxiety, digit ratio.

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### Introduction

Human beings have emotions throughout their life. Oatley and Johnson-Laird<sup>(1)</sup> say that every emotion is related to the achievement of personal goals; therefore, happiness is linked to the progress towards the goal whereas sadness is linked to the failure or non-achievement of a goal. Anger arises when a plan goes awry or is blocked and anxiety emerges when a goal is threatened, and so on.

However, there are many studies that have focused on the effect that emotions have on cognitive processes such as perception, attention and memory<sup>(2)</sup>.

The aim of the present work is to evaluate in a sample of students of the graduate course in Psychology, whether the ratio between the length of the second finger and that of the fourth finger of the hand (digit ratio, 2D:4D) is capable of predicting the access to the course and academic success. Two performance variables, such as the ranking position obtained by students at the admission test for the

graduate course in Psychology and the mean score in the final exams at the end of each teaching unit, are objective and readily measured. The first should mainly be indicative of prompting decision-making and ability to take risks, whereas the second should look at the planning capabilities with a more methodical approach. Moreover we analyzed levels of anxiety, stress and mood.

We have also evaluated the level of aggressiveness of our students by using the State Trait Anxiety Inventory (STAI), the Scale MSP (Mesure du Stress Psychologique) and the Profile of Mood States (POMS). The rationale was related to the hypothesis that prenatal androgens affect levels of aggression in terms of the position in the ranking score and the average academic success. In fact, it was supposed that a high amount of testosterone, to which subjects were exposed during pregnancy and detectable by the digit ratio<sup>(3-6)</sup>, is correlated with a high aggression. In fact, according to our prediction a smaller digit ratio (that is, a ring finger longer than the index finger) should coincide with a gra-

ter propensity to the persistence and determination in overcoming obstacles that interfere with their goals<sup>(7-11)</sup>. The investigated aggressiveness is understood in a positive and adaptive sense, such as tendency to pursue success, even if risky. In fact, the existing literature suggests that prenatal androgens are able to influence the development of the brain allowing for increased confidence in themselves<sup>(12-16)</sup>, a greater desire to act<sup>(17-21)</sup> and positively affecting the cognitive domains<sup>(22)</sup>.

## Materials and methods

The sample consisted of 152 students, 21 males (13.8%) and 131 females (86.2%), aged between 19 and 49 (mean age 21 years  $\pm$  3.7), of the graduate course of Psychology at the University of Catania. For all the recruited students we requested data of their curricula studiorum from the University's database in order to obtain the performance indicators used in the present study, i.e. ranking position on admission tests and average exam ratings. All the subjects signed informed consent documentation in accordance with the Ethical Committee of our University prior to their participation in the study.

Were administered the following tests

### *State Trait Anxiety Inventory (STAI)*

The State Trait Anxiety Inventory (STAI) developed by Spielberger (23) was used to assess anxiety. The test consists of 40 items, 20 of which assess state anxiety and 20 to stretch.

For the evaluation of anxiety status was asked subjects to respond by indicating on a scale of 1 to 4 as they thought that statement described them, expressing how they felt at that moment, however, for the assessment of trait anxiety they were asked to respond by indicating the frequency with which they felt the feelings described by item, based on how they felt generally. The scale of state was administered before the reach scale because if you reverse the order of administration may affect the validity of the test because of the emotional climate that can be created if it is administered before the reach scale<sup>(24-25)</sup>.

### *Mesure du Stress Psychologique (MSP)*

The Scale MSP (Mesure du Stress Psychologique) was used to assess stress. The test was translated and adapted by Di Nuovo and Rispoli<sup>(26)</sup>. The test is a questionnaire self - report

consists of 49 items to which the subject has to respond on a Likert scale that goes from 1 to 4 (where 1 indicates "not at all" and 4 "much"). The subject must respond by indicating how an item characterizes more or less its state of tension for the last 4 - 5 days. The test gives an excellent indicator of overall assessment of the state of psychological stress.

### *Profile of Mood States (POMS)*

The Profile of Mood States (POMS) developed by McNair et al.<sup>(27)</sup> at Boston University School of Medicine was used to assess mood states.

The test consists of 58 adjectives and phrases to which the subject has to respond in a scale from 0 (not at all) to 5 (very much). The items examining six different factors: factor T (tension - anxiety), factor D (depression - dejection), factor A (aggression - anger), factor V (force - activities), factor S (tiredness - laziness), factor C (confusion - confusion). The subscale scores can be combined to form an overall measure of affect that is labeled Total Mood Disturbance (TMD = T+D+A-V+S+C).

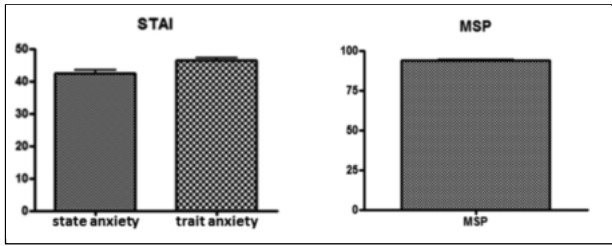
### *Digit Ratio (2D:4D)*

To test the methodology on the digit ratio please refer in a previous paper<sup>(6)</sup>. Briefly, the 2D:4D ratio was determined from photocopies of the right hand. The handprints of the subjects were measured for 2D:4D ratio by the same author (RN) using calipers, accurate to 0.2 mm. In the index and ring finger the digit length from the metacarpo-phalangeal crease (the most proximal between finger and palm) to the fingertip was measured.

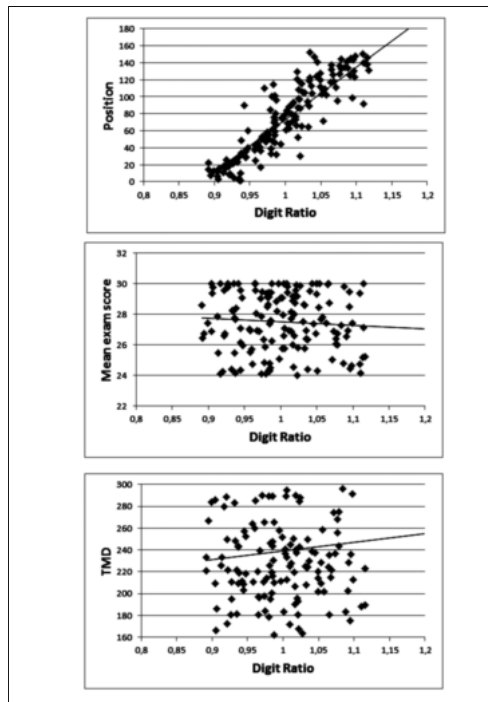
## Results

In figure 1 shows, at the left, that the levels of state anxiety and those of trait anxiety, obtained with the Test STAI are above average levels. Same Figure shows, at the right, the values obtained from M.S.P.; it can be seen that the sample shows a high level of stress.

Figure 2 shows, for the 152 students, the correlations between the digit ratio and the final position at the admission test (A), between the digit ratio and the average exam ratings (B) and between the digit ratio and TMD (C). It can be seen that it can be seen while there is a significant negative linear correlation ( $P < 0.0001$ ) between digit ratio and the final position at the admission test, there is no statistically significant correlation between digit ratio and the other two variables.

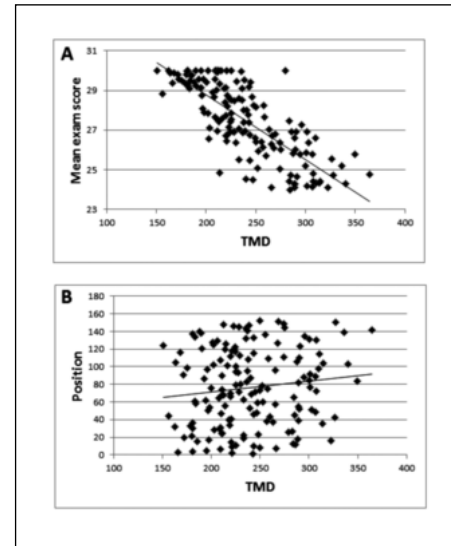


**Figure 1:** On the left levels of state anxiety and those of trait anxiety (mean values  $\pm$  SD), obtained with the State Trait Anxiety Inventory (STAI). On the right, mean values ( $\pm$  SD) obtained by using the the Mesure du Stress Psychologique test (M.S.P).



**Figure 2 A:** correlation between the digit ratio and the final position at the admission test by the 152 students; it can be seen that the lower is the digit ratio, the better was the ranking ( $p < 0.0001$ ). B: correlation between the digit ratio and the average exam ratings of the students' sample; no significant correlation was observed. C: correlation between the digit ratio and Total Mood Disturbance (TMD) of our sample; no significant correlation was observed.

Figure 3 shows the correlation between the TMD and the average exam ratings of the students' sample (A) and final position at the admission test (B). It can be seen that it can be seen while there is a significant positive linear correlation ( $P < 0.0001$ ) between TMD and the average exam ratings, there is no statistically significant correlation between TMD and the final position at the admission test.



**Figure 3 A:** correlation between the Total Mood Disturbance (TMD) and the average exam ratings of the students' sample; it can be seen that the higher is the TMD, the better was the examination performances of students ( $p < 0.0001$ ). B: correlation between the TMD and final position at the admission test by the 152 students; no significant correlation was observed.

**Conclusions**

The examined sample of students showed a significant level of anxiety and stress; in the case of college students, recent studies recommend that, in order to obtain a better academic performance, the practice of aerobic physical activity<sup>(28-36)</sup>. The rationale is that improving the overall performance of the subjects will be able to get a more probable success<sup>(36-47)</sup>.

Manning and colleagues underlined how testosterone levels play a key role in decision-making process. They studied men playing the ultimatum game, in which two players must decide how to divide a sum of money<sup>(3-4)</sup>. The first player proposes how to split the sum between the players, and the second player (the receiver) may accept or reject this proposal. If the second player rejects, neither player receives anything. If the second player accepts, the money is divided by to the proposal. It was observed that receivers with a lower digit ratio had a higher probability to reject the proposal. Another study observed that the stock traders have obtained more profits in the days when the testosterone levels in the blood were high<sup>(3-4)</sup>.

In this work was observed that students with a low digit ratio seem more able to handle the conditions requiring a quick decision, determination, risk acceptance and /or boldness in the face of novelty<sup>(6)</sup>.

The present results confirm the relationship between aggressiveness and digit ratios and support the hypothesis that students with lower digit ratios have improved performance in the admission test, where is important a prompt decision making, but not in exams during the academic year, where planning capabilities seem to play a more significant role. Conversely, the present investigation points out that the level of stress, expressed as TMD, while affects the academic performance of the students does not seem to have played a significant role at the time of admission test. No, significant difference was observed between men and women .

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