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Digit Ratio (2d:4d) in Patients with Antisocial Personality Disorder

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ABSTRACT

Objective: The present study aimed to compare the 2nd finger to 4th finger ratio (2D:4D) of patients with antisocial personality disorder to the 2D:4D of a group of healthy subjects.

Method: A total of thirty one male patients with antisocial personality disorder and the twenty-eight healthy controls were included in the present investigation. Finger (2D) and ring (4D) lengths and 2D:4D ratio of the subjects were determined.

Results: In the present study, we found that patients with antisocial personality disorder had a significantly lower ratio of 2D:4D of both hands.

Conclusion: In conclusion, we suggest that patients with antisocial personality seem to have a lower ratio of 2D:4D compared to healthy control subjects, leading us to think that higher prenatal gonadal androgens may be related to antisocial personality disorder.

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Introduction

An antisocial personality disorder is one of the personality disorders that is placed in B cluster personality disorders in Diagnostic and Statistical Manual of Mental Disorders 5 (DSM 5). It is characterized by a pervasive pattern of disregard for the rights of other people that manifests as hostility and/or aggression [1]. On the other hand, manipulation and deceit are other important clinical characteristics. In general, its clinical features start to appear in the childhood period of their life. It is accepted as a life-long condition, with a prevalence of 1-3% of the general population and 40-70% of the people staying in prisonsn. As in other personality disorders, little is known about the occurrence of antisocial personality disorder, as much it is well-known that genetic factors are important. On the other hand, it has been proposed that antisocial behaviors might be associated with alterations in different brain regions [2-4].

The digit ratio [the 2nd digit (index finger) and 4th digit (ring finger), 2D:4D] has been described as the ratio of the lengths of the second and fourth digits of the hand. Recently, the relative length difference between 2D and 4D has been the subject of the various psychiatric conditions. Different investigations have emphasized the relationship of a variety of psychological traits and psychiatric disorders to the 2D:4D. 2D:4D is a sexually dimorphic feature. It has been linked 2D:4D to prenatal testosterone and estrogen, suggesting that the ratio of 2D:4D might be affected by higher prenatal testosterone levels or greater sensitivity to androgen. Because of this effect, it is believed the ratio of 2D:4D to be established in the early development period in males, there has been a relatively shorter 2nd finger than 4th finger, while females have 2nd and 4th digits of equal lengths or a longer 2nd finger compared to 4th finger. So, the 2D:4D of the males is generally lower than that of the females. On the other hand, it has been shown that this lower is obvious on the right side compared to the left side of the hands [5-12].

As much there have been contrary knowledge, prenatal exposure to androgens has been emphasized as a determinant of aggressive behavior in later life. In males compared to females, life-time persistent antisocial behaviors are reported to be over ten times. This relationship led the investigators to consider that male gonadal hormones such as testosterone, might play an important role in the occurrence of antisocial behaviors. Antisocial personality disorder and conduct disorder are both associated with higher levels of testosterone. On the other hand, Dabbs and Morris reported that army veterans with the presence of conduct disorder symptoms during childhood period to have 1.4 times more likely in high free testosterone subjects compared to low free testosterone subjects. Additionally, some investigations have determined that there have been significant positive correlations between conduct disorder symptoms which were retrospectively described, and total testosterone values in childhood and adulthood [13-29].

Low 2D:4D which corresponds to masculine and androgenic type has been reported to be correlated with greater values of aggression and sensation seeking, and physically aggression in males [7,8].

In the present study, our hypothesis was that patients with antisocial personality disorder would have a lower 2D:4D compared to that of healthy control subjects.

Methods

We measured 2D:4D in the right and left hands of thirty one patients who had applied to our in-patient and out-patient clinics at Firat University School of Medicine Department of Psychiatry, Elazig, Turkey. All patients were diagnosed with an antisocial personality disorder by a senior psychiatry assistant by using the DSM 5. Edition criteria. Based on their answers to the question: "what is your sexual orientation?", all patients had a heterosexual orientation. We took the approval of the Local Ethics Committee at the Firat University School of Medicine. After this approval, from all subjects, written informed consent was obtained to participate in the study. We used some exclusion criteria: being under eighteen years old, the presence of congenital anomaly consisting of bones, and the existence of acromegaly. On the other hand, the same number of healthy control subjects were included in the study. They were age and sex-matched ones. Some criteria were also administered to the healthy control subjects. Healthy control subjects were in healthy physical and mental status. First of all, those who had any current or previous history of neurological or psychiatric conditions, endocrinologic abnormalities, and had congenital anomalies consisting of bones, and acromegaly were not included in the investigation.

Digit Ratio (2D:4D) Procedure

For all patients with antisocial personality disorder and healthy control subjects, it was photographed the left and right-hand palms by keeping the camera perpendicular to the palms side in the same height. When we took the image of the hand, the participants were asked to spread their fingers and hand palms as possible. These images were utilized to determine the digit length and ratio of the subjects. The total lengths of the second and fourth digits were quantified from the middle of the basal crease to the fingertips. Each of the second and fourth fingers was measured three times by two independent raters who were blind to the subjects' group. We took the average values for each finger after the measurements. After this process, we determined the ratios of digit lengths between index finger and ring finger and accepted the average digit ratio value of two measurements as the final result. All measurements were performed by digital sensitive calipers, with the sensitivity of the nearest 0.01 mm. The unit of the finger length presented in Table 1 was in centimeters.

Table 1: Demographic, clinical and digit measurement data

		Antisocial case group (n=31)	Healty control group (n=28)	p value
Age	Mean ± SD	33.29 ± 8.42	34.17 ± 8.81	0.695
Gender	Male	27 (87.1 %)	18 (64.3 %)	0.040
	Female	4 (12.9 %)	10 (35.7 %)	
Marital status	Married	19 (61.3 %)	20 (71.4 %)	0.411
	Single	12 (38.7 %)	8 (28.6 %)	
Education status	middle school and below	23 (74.2 %)	10 (35.7 %)	0.003
	high school and above	8 (25.8 %)	18 (64.3 %)	
Economical status	Lower	22 (71 %)	6 (21.4 %)	<0.001
	Middle	9 (29 %)	20 (71.4 %)	
	Upper	0	2 (7.1 %)	
Working status	Employed	17 (54.8 %)	24 (85.7 %)	0.010
	Unemployed	14 (45.2 %)	4 (14.3 %)	
suicide attempts	Yes	8 (25.8 %)	0	0.005
	No	23 (74.2 %)	28 (100 %)	
Dominant hand	Right	29 (93.5 %)	24 (85.7 %)	0.409
	Left	2 (6,5 %)	4 (14,3 %)	
Tobacco use	Yes	18 (58.1 %)	14 (50 %)	0.535
	No	13 (41.9 %)	14 (50 %)	
Alcohol use	Yes	12 (38.7 %)	0	<0.001
	No	19 (61.3 %)	28 (100 %)	
Self-mutilation	Yes	11(35.5 %)	0	<0.001
	No	20 (64.5 %)	28 (100 %)	
Forensic event	Yes	8 (25.8 %)	0	0.005
	No	23 (74.2 %)	28 (100 %)	
Presence of psychiatric illness in the family	Yes	10 (32.3 %)	7 (25 %)	0.539
	No	21 (67.7 %)	21(75 %)	
2D/4D ratio	Left hand (Mean ± SD)	0.965 ± 0.011	0.979 ± 0.026	0.021
	Right hand (Mean ± SD)	0.967 ± 0.011	0.978 ± 0.025	0.041

The finger length unit presented in Table 1 is centimetre.

Statistical Analysis

SPSS v16.0 software was used for statistical analysi (SPSS Inc., Chicago). For continuous variables and finger lengths, it was used independent sample t-tests. On the other hand, when required, for categorical variables, a Pearson chi-square test was utilized. Correlation relationships were analyzed by using Pearson correlation coefficient. The p-value <0.05 was regarded as having a significant difference. For categorical variables Fisher exact test was used.

Results

First of all, we did not detect any statistically significant difference in terms of some demographic and clinical variables while detecting for some others, as shown in Table 1. Reliability of the two raters was high for both the right hand (2D: ICC=0.99; 4D: ICC=0.99; 2D□4D: ICC=0.98) and the left hand (2D: ICC=0.98; 4D: ICC=0.99; 2D□4D: ICC=0.98).

We found that the mean digit ratio of 2D:4D for the left hand of patients with antisocial personality disorder and healthy control subjects were 0.965±0.011 and 0.979±0.026, respectively. The mean digit ratio of 2D:4D of the patient group was statistically significantly different from that of healthy comparisons (p<0.05). On the other hand, we observed that the mean digit ratio of 2D:4D for the right hand of patients with antisocial personality disorder and healthy control subjects were 0.967±0.011 and 0.978±0.025, respectively. Likewise, the mean digit ratio of 2D:4D of the patient group was statistically significantly different from that of healthy comparisons (p<0.05).

When performed on correlation analyses, we did not observe any correlational associations between any demographic variables and the ratio of 2D:4D for both sides of hands and scale scores for both study groups of patients with antisocial personality disorder and healthy controls (p>0.05).

Dıscussıon

In the present study, we determined that both sides of ratios of 2D:4D were statistically significantly lower than those of healthy comparison subjects, without any correlation between any demographic variables and the ratio of 2D:4D for both sides of hands and scale scores for both study groups of patients with an antisocial personality disorder.

As in our previous unpublished study in which has been performed on patients with a borderline personality disorder, we think that because the ratio of 2D:4D might be conversely associated with the prenatal exposure to androgens, our present results on patients with a borderline personality disorder can show that increased androgen exposure during the fetal period might be raising the risk for the occurrence of antisocial personality disorder. Our results are in accordance with the study of Martel et al.' who revealed that lower 2D:4D is related to attention deficit hyperactivity disorder symptoms in male patients but not in female ones [30]. Recent years, in various medical and psychiatric conditions, the ratio of 2D:4D has been measured. Concerning psychiatric disorders, especially aggression and impulsivity related conditions, the ratio has been taken attention. Because prenatal exposure to androgens has been proposed to be linked to aggressive behaviors in the later period of life [13-16]. In association with this, in patients with conduct disorder, the ratio of 2D:4D has been evaluated [31]. Because there has been reported an association between aggressive and impulsive behaviors and the ratio of 2D:4D, our study team examined the ratio of 2D:4D in patients with borderline personality disorder and healthy control subjects comparatively in a cross-sectional designed study and detected that patients with borderline personality disorder had lower 2D:4D ratio compared to healthy control subjects, suggesting that higher prenatal androgenic exposure during the fetal period may be associated with a borderline personality disorder. Antisocial personality and borderline personality disorders are both placed in the same category of personality disorders, in the B cluster, in the DSM 5. They have some similar clinical characteristics such as aggression, and impulsive behaviors. Moving from this point, our similar results with both borderline and antisocial personality disorders which were the lower ratio of 2D:4D led us to consider that patients with an antisocial personality disorder might have exposure to raised androgenic hormones during the fetal period of life compared to healthy control comparisons, as speculated in our previous another study on patients with borderline personality disorder (Atmaca et al., unpublished study).

Our present study has some similar limitations, as in our previous study on patients with borderline personality disorder (Atmaca et al., unpublished study). First one, the sample size of the study was small for such types of investigations. Second one, this type of studies includes sensitive measurements, individual differences to measure may influence our findings. However, as mentioned in the Methods section, each of the second and fourth fingers was measured three times by two independent raters who were blind to the subjects' group and wee took the average values for each finger after the measurements, and finally, we determined the ratios of digit lengths between the index finger and ring finger and accepted the average digit ratio value of two measurements as the final result.

Conclusion

In Conclusion, we suggest that patients with antisocial personality seem to have a lower ratio of 2D:4D compared to healthy control subjects, leading us to think that higher prenatal gonadal androgens may be related to antisocial personality disorder.

Conflict of Interests

The authors declare that they have no conflict of interest relating to this study or to this publication.

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