

Correlation Between Personality Traits and Testosterone Concentrations in Healthy Population

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ABSTRACT

Objective: High plasma testosterone levels have been associated with aggression, sexual behaviour and social status. The aim of this paper was to study the correlation between basal plasma testosterone levels and personality variables in healthy participants. **Materials and Methods:** Fifty-four participants were randomly enrolled into this study. Basal plasma testosterone levels were measured between 8:30 am and 10 am. After 24 hours of blood drawing, each subject completed personality questionnaires. **Results:** Positive correlation between basal plasma testosterone levels and anti-social personality traits in both genders was observed ($r = 0.336$ and $P < 0.018$). Also, a positive correlation was observed between basal plasmatestosterone levels and criminal thinking traits ($r = 0.376$, $P < 0.05$) and Millon compulsive ($r = 0.386$, $P < 0.010$) in both genders. In female participants, a positive correlation between basal plasmatestosterone levels and psychoticism ($r = 0.25$, $P < 0.019$) and Cloninger AUTO TCI ($r = 0.507$, $P < 0.004$) was observed. In males participants positive correlation between baseline plasmatic Testosterone levels and Millon Antisocial trait ($r = 0.544$, $P < 0.19$) and Millon Hypomania trait ($r = 0.485$, $P < 0.41$) and Millon Drug Abuse trait ($r = 0.632$, $P < 0.05$) was reported. **Conclusion:** Our results suggest gender differences in clinical and personality variables related with basal plasma testosterone level. In men, high plasma testosterone levels were associated with clinical traits, substance abuse and hypomania. Women with higher basal testosterone levels showed higher scores on personality self-direction traits.

Key words: Anti-social behavior, gender differences, hypomania, personality traits, testosterone


INTRODUCTION

Testosterone (T) is a steroid hormone involved in brain development, reproductive physiology and social behaviour.^[1] High plasma levels of T have been associated with anti-social and aggressive behaviour;

however, psychobiological mechanisms underlying this effect are still unknown.^[2]

Primary research conducted in special participants, such as prisoners and psychiatric patients, observed association between high plasma T levels and aggressive behaviour.^[3,4] The seeking for aggressive behaviour factors found a correlation between basal plasma T levels and personality traits such as hostility, sensation seeking, risk disposal or dominance in males.^[5-7] However, research of T and personality conducted in women, have not clarified the influence of this hormone in aggressive or anti-social behaviour.^[8]

The pharmacological administration of T in healthy

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subjects has been associated with increased aggressive behaviour.^[9] Some research show that giving additional T to women increase impulsivity and complicate the recognition of some emotions aspects that can lead to aggressive or anti-social behaviour.^[10,11]

We hypothesize that T would be related with aggressive behaviour and impulsivity in healthy population, and that gender differences would be reported by comparing men and women personality traits with T baseline plasmatic levels.

The aim of this paper was to study the correlation between baseline plasmatic T levels and personality traits in healthy subjects. This study provides a unique opportunity to evaluate gender differences related with basal plasma T levels and personality traits. Specifically, the purposes of this study were to examine:

1. The relationship between T and aggressive behaviour in healthy population;
2. relationship of plasma T levels and personality traits in both genders;
3. Relationship of plasma T levels and impulsivity in both genders.

MATERIALS AND METHODS

Fifty-four subjects between 20 and 43 year old were selected randomly from public institutions. A psychiatric screening was conducted using the structured clinical interview for axis I Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM IV) (SCID-I) and the structured clinical interview for axis II DSM IV (SCID-II). The interview was performed by a trained psychiatrist. Subjects with mental disorder or substance abuse disorders were excluded. Women under contraceptive treatment and subjects under medical treatment that could interfere with hormone levels were also excluded.

Sample characteristics are shown in the table below [Table 1].

Table 1: Sample characteristics

	Female	Male	Both
N	34 (58.6%)	20 (34.5 %)	54
Mean Age	25.08 (6.29 DS)	23.2 (0.78 DS)	24.14

Table 2: Baseline testosterone concentrations

		Percentile							
	Gender	5	10	25	50	75	90	95	
Weighted average (Definition 1)	baseline testosterone	Female	,1000	,2500	,5000	,8500	1,2000	1,8000	2,0500
		Male	7,0750	8,5500	12,5000	16,2500	21,7500	27,8000	31,8000
Tukey's Hinges	baseline testosterone	Female			,5000	,8500	1,2000		
		Male			12,5000	16,2500	21,5000		

Procedure of plasma assay

Basal plasma T levels were measured between 8:30 am and 10:00 am, when the patient was at rest. The sample was immediately centrifuged, plasma withdrawn and refrigerated until assayed. All assays were performed within 60 hours.

Personality inventories and statistical analysis

Twenty-four hours after the blood drawing, each subject completed six psychological questionnaires, to observe different personality dimensions, such as impulsivity, sensation seeking, anxiety and mood disturbance. The questionnaires used were: 'The Millon Clinical Multiaxial Inventory-II', "Barratt impulsivity scale",^[12] 'Sensation seeking scale',^[13] 'State-anxiety trait questionnaire',^[14] 'Temperament and Character Inventory revised'^[15] and 'Eysenck Personality Questionnaire revised',^[16] For all correlations, the Spearman correlation coefficient was used. Results were considered significant with a *P* under 0.05. Data analysis was performed with the statistical software package Statistical Package for the Social Sciences (SPSS) 15.

RESULTS

Mean baseline T: 6.93 ng/ml standard deviation 8.89.

Females: 0.91 ng/ml standard deviation 0.54.

Males: 17.18 ng/ml standard deviation 6.69 [Table 2].

Both genders

We observed a significant positive correlation between plasma T level and anti-social personality traits in both genders ($r = 0.336$ and $P < 0.018$). Also a positive correlation was observed between plasma T level and criminal traits ($r = 0.376$, $P < 0.05$) and Millon compulsive ($r = 0.386$, $P < 0.010$) [Table 3]. We observed negative correlation between plasma T level and Barrat Impulsivity ($r = 0.271$, $P < 0.05$) and Barrat motor impulsivity ($r = 0.306$, $P < 0.026$) in both genders. Also, a negative correlation was observed between plasma T level and Neuroticism ($r = 0.335$, $P < 0.02$).

Females

We observed positive correlation between plasma T level and Psychoticism ($r = 0.25$, $P < 0.019$) and

Cloninger AUTO TCI ($r = .0507, P < 0.004$) in female participants [Table 4]. No significant negative correlations were observed in female participants.

Males

We observed positive correlation between T and millon anti-social ($r = 0.544, P < 0.19$) and millon hypomania ($r = 0.485, P < 0.41$) and millon drug abuse ($r = 0.632, P < 0.05$) in males participants [Table 5]. We observed negative correlation between T and neuroticism ($r = 0.233, P < 0.023$) in male participants [Table 6].

DISCUSSION

Our results indicate a relationship between basal T level and some personality variables in a healthy population. The influence of high levels of T over personality traits is different between men and women. While men with higher plasma T level have high scores in anti-social traits, drugs abuse and hypomania, for women, high basal level of T is related to self-direction variables.

In both genders, high basal T levels were associated with anti-social personality traits. Our data is consistent with other studies linking T and anti-social behaviour.^[17-20] This result shows that the relation between anti-social behaviour and T can be found also in adults without psychiatric disorders. It has been proposed that the relation between anti-social behaviour and T may be measured by both psychosocial factors as social status, dominance, empathy or relational contextas for biological factors, such as serotonin or cortisol.^[19,21,22]

The relationship between drug use and T has been

Table 3: Testosterone correlation in both genders

Positive correlation	Negative correlation
Antisocial traits ($r=0.336, P<0.018$)	Barrat Impulsivity ($r=271, P<0.05$)
Criminal traits ($r=0.376, P<0.05$)	Barrat motor impulsivity ($r=306, P<0.026$)
Millon compulsive ($r=0.386, P<0.010$)	Neuroticism ($r=335, P<0.02$)

Table 4: Testosterone correlation in females

Psychoticism	$r=0.25, P<0.019$
Cloninger AUTO TCI	$r=0.0507, P<0.004$

Table 5: Testosterone correlation in males

Millon Antisocial	$r=0.544, P<0.19$
Millon Hypomania	$r=0.485, P<0.41$
Millon Drug Abuse	$r=0.632, P<0.05$

Table 6: Negative Testosterone correlation in males

Neuroticism	$r=0.233, P<0.023$
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shown in adolescents, combined with maturing factors.^[23] We believe that in healthy adults and those of our population the relationship may be bidirectional, and may be measured by similar factors such those put forward in the case of anti-social personality traits. This hypothesis should be tested in future investigations.

The hypomania scale detects periods of superficial happiness, high self-esteem overactivity or distractibility. Our findings show a relationship with the findings of other authors.^[24] These authors showed that the weekly administration of 600 mg of T causes hypomaniac symptoms in healthy men. The relationship of T with mood is also being studied in relation to the possible influence of low T levels may have in depression.^[25] In our sample, high T levels are related with hypomanias symptoms; however, low T levels had no relation with any measures of depressive symptoms.^[25]

In women, a positive correlation between basal T and the self-direction scale of Cloninger's TCI test was obtained. Self-direction is the ability to control, regulate and adapt behaviour to own goals. High scores are related to autonomy, adaptation and reliance of own resources. Our finding is related to such found by.^[26] This author found that women with high T concentrations tend to be more active, self-directed and decisive. More recently found a relationship between high T levels and high professional status in women. In the adjective list, these women defined themselves among other terms, as independent, strong and aggressive. Our data supports the hypothesis that women with higher T levels, present certain personality traits characteristic of empowerment and achievement. Regarding gender differences, it is important to mention that women with higher levels of T have a higher degree of psychoticism following Eysenck's dimensional model. Furthermore, psychoticism is considered the opposite dimension to neuroticism, which characterizes emotional instability and risk avoidance tendency. This result can explain why women with higher levels of T show less depressive disorders and show more control of their acts.

Another important aspect of our research was that we did not observed correlation between impulsivity and high levels of T. Research in anti-social personality disorder observed an association between T and aggressive behaviour and impulsivity; however, in our sample, no association between impulsive pattern and T was observed.

Some studies on aggression have found some relation between T and measures of potential mediating factors such as the Sensation Seeking Scale, the Karolinska personality questionnaire or the Einsenk personality questionnaire.^[20,27-32] The present study cannot confirm

these data, either in men or women and would be included among those who report a lack of results.

Finally this study has some limitations that should be taken into account. This study is based on correlations, and the calculation of many correlations increases the risk of a type I error (false positives). Also the sample is limited in number; there are many other biological factors that can affect to our results. Future studies should confirm our findings overcoming these limitations.

Our results suggest gender differences in clinical and personality variables related with basal plasma T level. In men, high plasma T levels were associated with clinical traits, such as anti-social, substance abuse and hypomania. In men, low basal T levels were associated with less neuroticism. In women, high basal T levels were associated with personality self-direction traits, such as Psychoticism dimension and Cloninger AUTO TCI dimension. In both genders, high basal T levels were associated with anti-social personality traits and compulsivity. Low basal T levels were associated with less impulsivity in both genders. The nature of these relationships should be studied in future investigations. Clinical measures such as MCMII II or TCI R can be sensitive tests for biological variables in personality studies.

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