

# Exploratory Study on the Association of Antisocial Behaviour and Testosterone Level

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## Abstract

The research examined testosterone concentration among indicted subjects on various crimes to explore the potential association between testosterone levels and several antisocial behaviours in indicted persons serving in Kuje prison. Subjects, 76 prisoners, were orally informed of the study protocols, and they consented before testing began. The biodata on various crimes shows they are youths (31 years) and in the healthy anthropometry. The mean testosterone concentration (pmol/L) and percentage (%) change from the normal testosterone (baseline) concentration (281.34) were as- Cultism (401.20: 42.32), drug abuse (361.80: 28.34), smoking (282.00: 0.03), alcoholism (282.53: 3.70), theft (283.59: 0.22), armed robbery (361.78: 28.34), murder (340.00: 20.61), vandalization (282.10: 0.07), rape (300.71: 6.67), rule-breaking (282.60: 1.14), physical abuse (299.00: 6.65), child molestation (278.16: 1.33) and destructiveness (308.50: 9.44). Cultism, drug abuse, alcoholism, armed robbery, murder, rape, physical abuse, child molestation, and destructiveness testosterone concentration were significant from the baseline testosterone concentration at  $p < 0.01$ . Smoking, theft, vandalization, and rule-breaking testosterone concentrations were non-significant from the baseline testosterone concentration at  $P > 0.01$ . The child molestation value was below the baseline value. The highest and lowest percentage change in testosterone concentration levels were in cultism (42.32%) and smoking (0.03%). Non-violent crime has a link to low testosterone, and violent crime has a link to high testosterone concentration in the research findings. High testosterone lowers the fear of consequences and gives the impetus to indulge in criminal acts. The finding of lower testosterone concentration in child molestation may depict non-violent and a case of taking advantage of a child.

**Keywords:** testosterone; antisocial behaviour; crime; prisoner; biochemical aspect

## Introduction

Where your rights end is the beginning of another person's right. This guide will help a conscious-minded person not to trample on the rights of others. The lack of consideration for the well-being of others in action describes the anti-social behaviours. This conduct violates the fundamental rights of other persons. It could be any behavioural display considered disruptive to others in society [1]. Many factors determine anti-social behaviour (ASB), including location, community tolerance, and quality of life expectations [2-3]. Because of this, what ASB to one person might be acceptable behaviour to others. The subjective nature of the concept makes it challenging to pinpoint a single definition of anti-social behaviour. Many people label behaviour deemed contrary to prevailing norms for social conduct as ASB.

ASB develops through social interaction within the family and community. It affects temperament, cognitive ability, and involvement with negative peers. It dramatically affects the cooperativity of problem-solving skills.

ASB is salient and perceived in all societies as intolerable. Scholars have long attempted to identify the biological determinants of ASB. Biological factors are likely involved in ASB, and the dogmatic rejection and blissful ignorance of the biological parameters of our behaviour by most scientists is a grey area. The researcher is exploring the possibility that Testosterone (Figure 1) in human males promotes aggressive and nonaggressive behaviours that enhance social status. Aggressive behaviour towards others connotes anti-social behaviour [4]. However, causal evidence distinguishing these accounts is lacking. The present research explores the role of behaviour and biological factors in connection to ASB. These are areas of great concern to society. The study will significantly provide a platform with broader views on the less attended influencer on behaviour. What are the emerging connections between anti-social behaviour and hormonal interference? The findings will shed light on this question. The research is of great importance for directions for future research and enhancing the quality of life of

individuals at risk of developing ASB. Arguably, ASBs are problems facing humanity in modern times [5]. Anti-social behaviour through the lens of a biochemist will shed light on the biology of anti-social behaviour. The

research aim was to explore the potential association between testosterone (Figure 1) levels and several anti-social behaviours.



**Figure 1:** Biochemical structure of testosterone.

## Materials and Methods

### Ethical considerations

All data were confidential. The personnel and participants of the study received a promise of confidentiality of their information. The study was under the ethical standards of the Declaration of Helsinki and in line with the standards of the Ethical Committee of the Nigeria Police Academy.

**Inclusion criteria.** The offender acted alone, and the subject was over eighteen years old. The offenders (76) who met these criteria consented to participation in the study. They did so willingly. The offenders were physically healthy, as determined from prison records, current medical examinations, and self-reports. None of the offenders were on psychotropic drugs or medication for chronic physical disease.

### Exclusion Criteria

Females and those who are 17 years and below. Inmates who were ill.

Saliva collection for testosterone measurement

The whole saliva specimens were by unsaturated passive drool at Kuje prison. The subject's head tilted forward to allow the saliva to pool on the floor of the mouth, and saliva was collected using the SalivaBio Collection Aid (SCA) into a polypropylene vial. It was done for each subject by a health personnel. The saliva specimens collected were between 7 a.m. and 9 a.m. The sample specimens were collected antiseptically. The baseline salivary testosterone concentrations were from ten volunteers from the Nigeria Police Academy who have no indicted criminal behaviour.

### Specimen Storage and Preparation

The sample specimen was kept at a temperature storage range of -0 to -4 °C until assayed. The specimens were thawed and carefully mixed. Afterward, the sample specimens were centrifuged (5 to 10) minutes before the assay.

### Salivary testosterone determination.

The determination was the method involving the principle of a competitive binding assay. The immunoassay of the salivary testosterone concentration was done thrice for each specimen, and the means used. Sampling was in singlicate on all three automated immunoassay instruments as specified in the manufacturer's manual on the procedure. The Chemiluminescent Microparticle Immunoassay (CMIA) technology (Chemiflex™) used in the study was sourced from Abbott Ireland Diagnostics Division Lisnamuck, Longford Co., Longford.

### Collection of Bio-, Sociodemographic, and Medical data:

Sociodemographic background, health issues, medications, marital status, length of incarceration, and family background of participants were obtained from oral interviews and their files by the personnel.

The data were expressed as means  $\pm$  standard deviation for testosterone concentrations. The percentage difference from the base-line testosterone concentration (from non-antisocial) calculated. Post Hoc would be determined to test for significance at 0.01, using SPSS.

## Results

The results are in Tables 1, 2, and Figure 2. Table 1 presents the Biodata of the participants, and Table 2 presents a list of antisocial behaviour and salivary testosterone concentration. Fig. 2 presents the percentage distribution of the Changes in testosterone, compared to the baseline testosterone concentration.

In Table 1, the mean age of all the participants was  $31.0 \pm 11.0$  years, with a range of 19 – 44 years at the time of research. The participants' mean height was  $177.1 \pm 6.4$  cm, with a range- 167 – 184 cm. The mean of the participant's weight was  $87.9 \pm 15.2$  kg and ranged from 60 to 98 kg. The participants' mean waist circumference in cm was  $89.0 \pm 11.0$ , and a range of 78 – 101. The mean of the Hip circumference of all the participants was  $105 \pm 9.4$  cm and a range of 96 – 108 cm. The mean of the hip: waist ratio of all the participants was  $0.85 \pm 0.09$  and a range of 0.83 – 0.87. The mean Heart rate (bpm) of all the participants was  $105 \pm 10.4$  and a range of 70 – 80. The mean

systolic blood pressure in mmHg of all the participants was 117.5±19 and a range of 100 – 130. The mean diastolic blood pressure in mmHg of all the participants was 73.1±13.2 and a range of 65 – 90.

Variable	Values	Ranges
Age in years	31.0±11.0	19 – 44
Height (cm)	177.1±6.4	167 – 184
Body Weight (kg)	87.9±15.2	60 – 98
Body Mass Index (kg·m <sup>-2</sup> )	27.9±4.2	21-30
Waist Circumference (cm)	89.0±11.0	78 – 101
Hip Circumference (cm)	105.2±9.4	96 – 108
Waist:Hip	0.85±0.09	0.83 – 0.87
Heart Rate (bpm)	72.6±10.4	70 – 80
Systolic Blood Pressure (mm Hg)	117.5±19	100 – 130
Diastolic Blood Pressure (mm Hg)	73.1±13.2	65 – 90

**Table 1.** Biodata of participants (inmate)

Table 2 shows the 76 antisocial behaviours and the respective testosterone concentrations alongside changes in testosterone concentration from the baseline testosterone. The antisocial behaviours extracted from their files and self-reported were as follows: Cultism, Drug abuse, Smoking, Alcoholism, Theft, Armed robbery, Murder, Vandalization, Rape, Rule-breaking, Physical abuse, Child molestation, and Destructiveness. The mean testosterone concentration (pmol/L) and their change from the baseline were 401.20: 119.30 in Cultism, 361.80: 79.90 in Drug abuse, 282.22: 0.10 in Smoking, 292.40: 10.50 in Alcoholism, 282.53: 0.63 in Theft, 361.78: 79.88, in Armed robbery, 340.00: 58.10 in Murder, 282.10: 0.20 in Vandalization, 300.71: 18.81 in Rape, 282.60: 0.70 in Rule breaking, 299.00: 17.10 in Physical abuse, 278.05: -3.74 in Child molestation, 308.50: 26.60 in Destructiveness. The mean baseline testosterone concentration of the non-antisocial behaviour was 281.90. Smoking (282.00), Vandalization (281.10), and rule-breaking (282.60) have testosterone concentrations closest to the

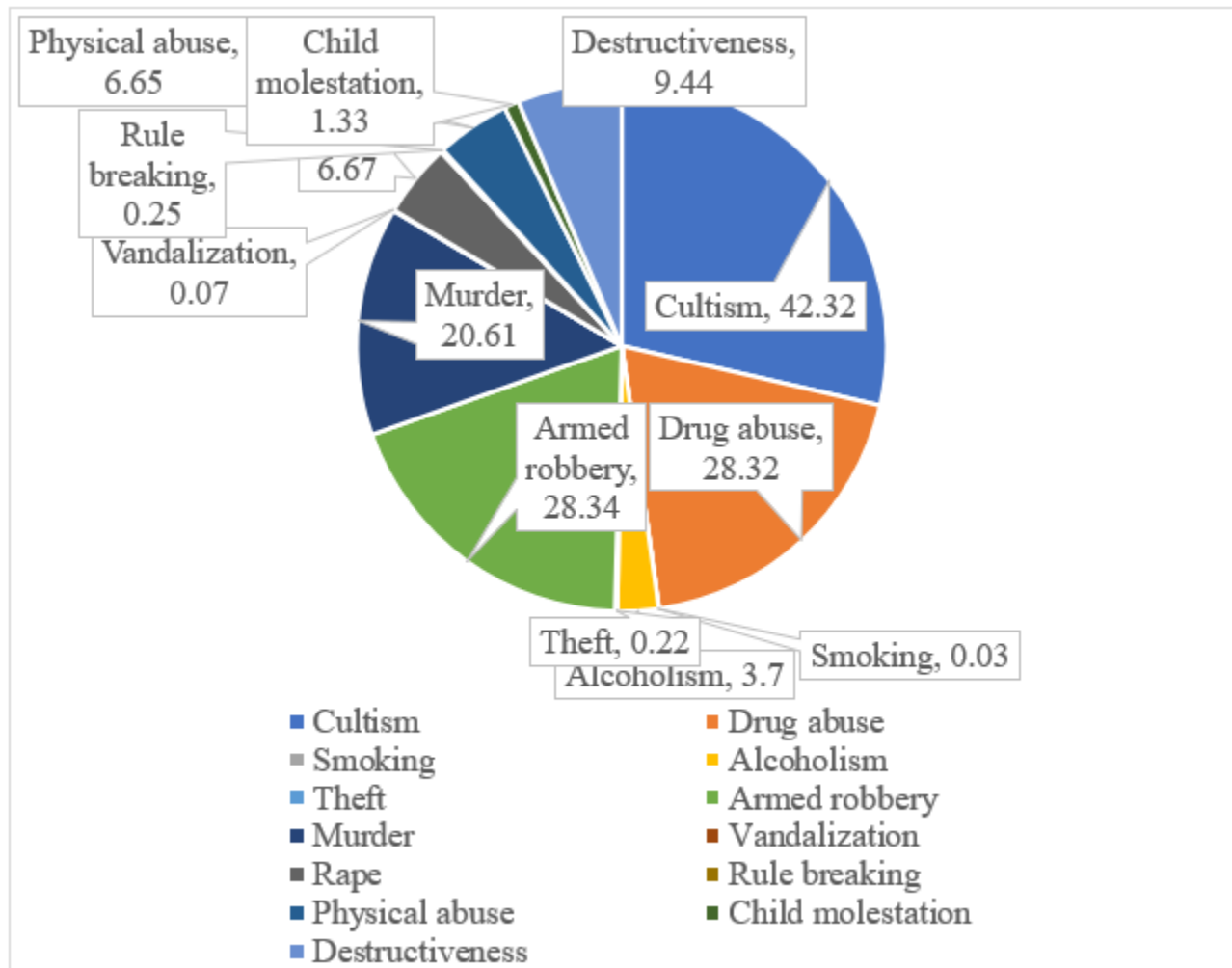
baseline testosterone concentration (281.90), while Cultism testosterone concentration (401.20) is most distant from the baseline testosterone concentration. There were significant differences in the testosterone concentration in Cultism, Drug abuse, Alcoholism, Armed Murder, Rape, Physical abuse, Child molestation, and Destructiveness compared to the baseline testosterone concentration, at P<0.01.

The testosterone concentration percentage change (%) was in Fig 2. They were: Cultism (42.32), Drug (28.34), Smoking (0.03), Alcoholism (3.70), Theft (0.22), Armed robbery (28.34), Murder (20.61), Vandalization (0.07), Rape (6.67), Rule breaking (0.25), Physical abuse (6.65), Child molestation, 1.33 and Destructiveness (9.44). All values were of some fractions above the baseline testosterone except the child molestation value, which was below. The highest and lowest percentage change was observed in Cultism (42.32%), Vandalization (0.07%), and Smoking (0.03%), respectively.

Antisocial behaviour	No of participants	Testosterone concentration	change in testosterone from Baseline
Cultism	5	401.20±1.30*	119.30
Drug abuse	5	361.80±1.48*	79.90
Smoking	6	282.00±1.25	0.10
Alcoholism	5	292.40±1.30*	10.50
Theft	7	282.53±1.60	0.63
Armed robbery	9	361.78±1.48*	79.88
Murder	5	340.00±1.58*	58.10
Vandalization	5	282.10±0.89	0.20
Rape	14	300.71±1.94*	18.81
Rule breaking	5	282.60±1.41	0.70
Physical abuse	6	299.00±1.41*	17.10
Child molestation	6	278.16±1.72*	-3.74
Destructiveness	7	308.50±2.88*	26.60
Non antisocial (Baseline)	10	281.90±1.60	-

Values bearing \* are significantly different (P<0.01).

**Table 2:** Salivary Testosterone Concentrations (pmol/L) of Persons Convicted of Some Anti-social Behaviours



**Figure 2:** Percentage change in testosterone levels of antisocial behaviours from non-antisocial.

### Discussion

Antisocial behaviour lowers the ability to have empathy and remorse, and it goes with weak behavioural controls [7]. Aside from the genetic and environmental factors that influence the onset of antisocial behaviour, malfunctioning of neuronal chemistry triggers the development of antisocial behaviour [8]. The abnormality of testosterone concentrations can trigger antisocial behaviour, and because of this, affected persons may fail to see the consequences associated with antisocial acts [9]. High testosterone concentration in humans consistently shows externalizing behaviour [10]. Booth *et al.* [11], Fang *et al.* [12], and Granger *et al.* [13] reported positive correlations between free testosterone and antisocial behaviour in male subjects.

The biodata of participants did not review any sign of a condition that could deny one’s participation (Table 1). They were in healthy anthropometry. It all falls within the research inclusion.

The criminal actions following the antisocial displays (behaviours) and their significant differences from the baseline discussed. The relationship was striking at the crime of Cultism, Drug abuse, Alcoholism, Armed robbery, Murder, Rape, Physical abuse, Child molestation and Destructives. This finding is similar to Bufkin [14] and Edwards [15]. Cultism and others are violent crimes [16]. It could mean that high testosterone built-up could be

the push to commit such antisocial behaviour [17-18]. All the antisocial behaviours, with significance, are associated with aggressiveness, and dominant behaviour has been reported [19-22]. It is least striking at Smoking, Vandalization, and child molestation crimes. They are nonviolent crimes [16] and may not require an upsurge in testosterone. Child molestation testosterone concentration lower than the baseline line testosterone concentration depicts it as a nonviolent crime [23]. It could be a case of advantage taking over a child and may not necessarily require aggressiveness. The non-significances of Smoke, Theft, Vandalization, and Rules-breaking may be suggestive of less connection to the aggressiveness that characterized violent behaviour. It is deducible from this study that nonviolent crime is associated with low testosterone concentration, while violent crime connects with high testosterone concentration. It is possible that elevated testosterone concentration lowers the fear of consequences and gives the impetus to indulge in criminal acts and damn the repercussion [24].

### Conclusion

The findings suggest that antisocial behaviour, at least in some cases, may be seen as a form of mental illness linked to physiological symptoms (involving a chemical imbalance of testosterone concentration). Researchers exerted that antisocial behaviour may be more biologically based than previously considered. Therefore, knowing the underlying biochemistry that creates the perfect enabling environment for a person to do something

unreasonably could lead to treatments that can keep hormones in check and deny them the courage to commit such acts. The scientist might be able to design treatment intervention options for the affected that are novel and effective for possible treatment for this disorder. It offers the chance to improve the lives of many afflicted and the communities in which they live. As with all observational studies, we acknowledge the possibility of residual confounding due to few measurements or measured characteristics, as the case may be.

### Conflicts of Interest

There is no conflict of interest.

### Authors' contributions:

Nwachukwu F. C., drafted the manuscript, did the literature search and, translated the idea into testable hypothesis. Joshua T. S., did the compilation of results and the statistical analyses. Both authors participated in the bench works and read the final manuscript and agreed to the contents.

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