



CSF testosterone: Relationship to aggression, impulsivity, and venturesomeness in adult males with personality disorder

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Abstract

Objective: Studies of various species suggest that testosterone, assayed in various compartments, is correlated with aggression and possibly related behaviors. The objective of this study was to assess the relationship between cerebrospinal fluid testosterone (CSF TEST) and measures of aggression, impulsivity, and venturesomeness in male personality disordered subjects and test the hypothesis that CSF TEST would correlate directly with each measure in this group.

Methods: Lumbar CSF for morning basal levels of testosterone were obtained from 31 male subjects with personality disorder. Aggression was assessed dimensionally through the use of the life history of aggression (LHA) assessment, and categorically by the research diagnosis of intermittent explosive disorder. Impulsiveness and venturesomeness were assessed using the Eysenck personality questionnaire - II (EPQ-II).

Results: CSF TEST did not correlate with measures of aggression or impulsivity but did correlate directly with venturesomeness ($r = .42$, $p = .021$). Adjusting for age and height modestly reduced the magnitude and statistical significance of this correlation.

Conclusions: In contrast to some published studies, CSF TEST was not found to have a significant relationship with aggression. The presence of a modest correlation between CSF TEST and venturesomeness, but not impulsivity, in male personality-disordered subjects suggests a possible relationship between CSF TEST and a type of sensation-seeking that involves consideration of the consequences of action taken.

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1. Introduction

Examination of extant empiric data supports a role for testosterone in mediating aggressive behaviors in both animal and human studies. In such studies, seasonal changes in testosterone correlate with seasonal changes in aggression (Lincoln and Davidson, 1977), pubertal increases in testosterone correlate with pubertal increases in aggression (Brain, 1979), and pharmacological administration of testosterone results in an increase in aggression (Sware and

Gandelman, 1975). These links are not as clear in humans, however, where relationships between basal testosterone levels and aggression are only modestly positive at best (Archer, 1991; Halpern et al., 1993; Mazur and Booth, 1998; Harris, 1999; Simpson, 2001; Book et al., 2001). With respect to the effect of exogenous testosterone on aggression, testosterone's effect on human aggression appears most likely at pharmacologically enhanced, rather than at physiological replacement, levels of the hormone. In one study, physiological replacement levels of testosterone in men had minimal effects on behavior while higher doses were associated with adverse psychological effects (Yates et al., 1999). In other studies, moderately higher doses

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(200 mg/wk) of testosterone given to male volunteers have been found to increase aggressive responding in laboratory paradigms (Kouri et al., 1995) and high dose testosterone administration (600 mg/wk) to men has been reported to increase manic symptoms, as well as verbal aggression, in some vulnerable individuals (Pope et al., 2000).

The relationship between basal levels of testosterone and aggression in subjects with psychopathologic conditions is similarly equivocal. In a study of alcoholic violent and non-violent offenders, impulsive offenders had higher CSF testosterone concentrations than healthy volunteers; in addition, CSF testosterone levels reportedly discriminated between violent and nonviolent offenders (Virkkunen et al., 1994a). In a different group of offenders, the same authors found positive correlations between CSF levels of free testosterone and aggressiveness (Virkkunen et al., 1994b). In contrast, one study of recent suicide attempts reported lower CSF levels of testosterone than those seen in other studies of aggressive violent subjects and positive correlations between CSF testosterone with irritability and verbal aggression, only, in a small group of Cluster B personality disordered patients (Gustavsson et al., 2003). In a study of domestic violence perpetrators, non-alcoholic perpetrators had similar CSF testosterone concentrations to that of healthy controls (George et al., 2001). Similarly, patients with PTSD, a disorder in which aggressive behavior is often prominent, have been shown to have lower CSF testosterone concentrations than healthy controls (Mulchahey et al., 2001).

Differences among these studies may be due to differences in subject groups and in the assessments of aggression and related behaviors. In this study, we sought to examine the relationship between CSF levels of testosterone and of aggression in a group of well-defined male personality-disordered subjects with validated assessments of aggression and other related behavioral traits. Since aggression and testosterone may also be associated with impulsivity (Bjork et al., 2001) and with aspects of sensation-seeking (Aluja and Torrubia, 2004) we also sought to examine the relationship between CSF Testosterone and assessments reflective of impulsivity and sensation-seeking: impulsivity (narrowly defined) and venturesomeness (Eysenck and Eysenck, 1977). Overall, we sought to test the hypothesis that CSF Testosterone would correlate positively with aggression, impulsivity, and sensation-seeking impulsivity.

2. Methods

2.1. Subjects

This article reports data from 31 physically healthy male subjects with a history of personality disorder in whom CSF was collected for testosterone measurement. All subjects were medically healthy and were systematically evaluated in regard to aggressive and other behaviors as part of a larger program designed to study the biological corre-

lates of personality-trait behavior in individuals with personality disorder. Study subjects were recruited by newspaper and public service announcements seeking subjects for biological studies of personality in general. Written informed consent, using an institutional review board-approved consent form, was obtained from all subjects after all procedures were fully explained. Medical health of all subjects was documented by medical history, physical examination, electrocardiogram, and blood hematology, chemistry (including hepatic profile), thyroid function tests, and urinalysis, including a urine screen for drugs of abuse.

2.2. Diagnostic assessment

Axis I and Axis II personality disorder (PD) diagnoses were made according to DSM-IV criteria (1994). Diagnosis of alcoholism (Coccato et al., 1989, 1996) and intermittent explosive disorder (Coccato, 2003) were made as previously described. Diagnoses were made using information from: (a) semi-structured interviews conducted by trained masters, or doctoral, level clinicians using the schedule for affective disorders and schizophrenia (Spitzer and Endicott, 1987) modified to include modules for the diagnosis of DSM Axis I disorders not covered by the original SADS for Axis I disorders, and the Structured Interview for the Diagnosis of DSM personality disorder (Pfahl et al., 1989) for Axis II disorders; (b) clinical interview by a research psychiatrist; and, (c) review of all other available clinical data. Final diagnoses were assigned by team best-estimate consensus procedures (Leckman et al., 1982; Klein et al., 1994) involving at least two research psychiatrists and three clinical psychologists as previously described (Coccato et al., 1996). This methodology has previously been shown to enhance the accuracy of diagnosis over direct interview alone (Kosten and Rounsville, 1992). Subjects with a life history of bipolar disorder, schizophrenia (or other psychotic disorder), current alcoholism or drug dependence, were excluded from this study.

The distribution of the personality disorders were as follows: Cluster A ($n = 7$) i.e., paranoid [$n = 6$], schizoid [$n = 2$], schizotypal [$n = 1$]; Cluster B ($n = 10$) i.e., antisocial [$n = 5$], borderline [$n = 4$], narcissistic [$n = 3$], histrionic [$n = 1$]; cluster C ($n = 8$) i.e., avoidant [$n = 1$], dependent [$n = 1$], obsessive-compulsive [$n = 6$]. Fourteen subjects were diagnosed with personality disorder NOS, and 23% of subjects met criteria for more than one personality disorder. Subjects had a mean of 0.6 ± 0.7 current Axis I disorders, a mean of 1.9 ± 1.6 lifetime Axis I disorders and a mean of 1.8 ± 1.0 Axis II disorders. Lifetime Axis I disorders were as follows: (a) mood disorder of any type [$n = 11$; i.e., major depression ($n = 8$), dysthymia ($n = 2$), depression NOS ($n = 3$)]; (b) intermittent explosive disorder ($n = 10$), (c) alcohol and/or drug dependence disorder ($n = 6$) and, (d) anxiety disorder of any type ($n = 2$) (i.e., simple phobia [$n = 1$] and specific phobia [$n = 1$]).

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