

## Executive and Nonexecutive Neuropsychological Functioning in Antisocial Personality Disorder

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### Abstract

#### Objective:

To examine the relationships between antisocial personality disorder and executive abilities as well as antisocial personality disorder with other domains of cognitive functioning.

#### Background:

Previous research has suggested that antisocial personality disorder is associated with impaired executive functioning. However, methodological limitations of past research have resulted in inconsistent findings.

#### Methods:

Executive functioning and other cognitive abilities were compared in four demographically matched groups of middle-aged community dwelling male veterans (N = 336). The groups were: (A) those with active antisocial personality disorder psychopathology; (B) those with a lifetime prevalence of antisocial personality disorder but inactive antisocial personality disorder psychopathology; (C) a nonantisocial personality disorder psychiatrically matched control group; and (D) a normal control group.

#### Results:

Multivariate analysis of variance revealed that the four groups were not statistically significantly different on measures of executive functioning or other cognitive abilities.

#### Conclusions:

Those with antisocial personality disorder perform at comparable levels to psychiatric and normal controls with respect to executive functioning and other domains of cognitive ability (i.e., language, memory, visuospatial, and motor abilities). An incidental finding was that, over time, the antisocial personality disorder groups improved more than control groups on a measure of general intellectual aptitude.

**Key Words:** antisocial personality, cognitive ability, executive functioning

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Symptoms of antisocial personality disorder (ASPD) such as impulsivity, poor planning, questionable judgment, and aggressive tendencies have raised the question of whether individuals with ASPD have impaired executive functioning abilities and frontal brain dysfunction. Previous research investigating this possibility has yielded inconsistent findings. Some studies have reported that antisocial adults, relative to comparison groups, demonstrate impaired performances on tasks of executive functioning<sup>1-4</sup> that may be linked to structural brain abnormalities, particularly in the prefrontal region.<sup>5-6</sup> However, other studies have not found statistically significant differences between ASPD and comparison groups on executive functioning measures<sup>7-10</sup> or in neuroimaging findings associated with frontal lobe dysfunction.<sup>11</sup> Still other studies have reported mixed findings.<sup>12,13</sup>

Several methodological limitations of previous research may account for these discrepant findings. One limitation of past studies has been small sample size. For example, two studies based their conclusions on fewer than 10 subjects.<sup>1,11</sup> Another limitation has been the failure to match ASPD groups and comparison groups on important demographic variables such as education and SES<sup>1,4,12</sup> or on comorbid psychiatric or substance abuse problems.<sup>1,2,5,9,13</sup> The issue of proper diagnostic classification of subjects has also limited the generalizability of results.<sup>2</sup> Specifically, many studies have investigated executive functioning in subjects

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drawn from prison populations. This has several diagnostic implications. First, certain ASPD criteria are ubiquitous among criminals (e.g., violation of social norms and laws, reckless disregard for others, aggressiveness), and if used as the basis for subject selection, many participants may be incorrectly classified with ASPD. Second, ASPD individuals who are incarcerated may represent more severe cases of the disorder. Third, many prison-based investigations of the neuropsychology of antisociality focus on the performance of psychopaths and not individuals with ASPD.<sup>7,8,13</sup> Although there is overlap in the diagnostic constructs of psychopathy and antisociality, there are also meaningful differences that undermine the generalizability of psychopathic findings to individuals with ASPD until proper replication studies are done.

Morgan and Lilienfeld<sup>15</sup> recognized the problem of disparate findings and tried to address some of the aforementioned methodological shortcomings in a meta-analysis of 39 studies ( $N = 4589$ ) of antisocial behavior and executive functioning. Because their focus was on executive deficits in individuals who show antisocial behavior, they combined various types of subjects in their analyses: prison inmates, juvenile delinquents, nonincarcerated criminals, and individuals with psychopathic personality, ASPD, and conduct disorder. Control groups included both psychiatric samples and healthy normal participants. They selected only studies that had used neuropsychological tests that incorporated volition, planning, purposeful action, and/or effective performance, such as the Wisconsin Card Sorting Test (WCST), verbal fluency, Category Test, Porteus Mazes, Stroop Color-Word Test, and Trails B. They found that individuals who displayed antisocial behavior did, in fact, show poorer performance (by 0.62 standard deviations [SD]) on executive functioning measures compared with control groups.

Although Morgan and Lilienfeld<sup>15</sup> concluded that "a robust and statistically significant relationship between [antisocial behavior] and [executive functioning] deficits" ex-

ists, their results are less clear regarding the relationship between executive functioning and ASPD. For example, when they compared individuals with ASPD to normal controls (a much more specific comparison), the previously "robust" statistically significant difference in executive functioning remained statistically significant but became negligibly small with an effect size (Cohen's  $d$ ) of only 0.08 (note: effect size was calculated by dividing the difference between the means of the groups by the pooled standard deviation).<sup>16</sup> Based on standardized effect sizes, criminality and delinquency were the classifications most highly associated with deficits in executive functioning ( $d = 0.94$  and  $0.78$ , respectively), suggesting that it may be antisocial behavior, irrespective of etiology, rather than ASPD that is tied to executive dysfunction.

Therefore, to clarify the ambiguous findings of previous studies, the current study was designed to investigate the presence of executive functioning deficits in community-dwelling individuals who met diagnostic criteria for ASPD. To expand on past research, the relationship of ASPD to other, nonexecutive domains of cognitive functioning was also examined. To avoid the limitations previously discussed, four groups were compared: (A) individuals with ASPD and active symptoms; (B) individuals with ASPD based on past behavior but without currently active symptoms; (C) psychiatric controls; and (D) normal controls.

## MATERIALS AND METHODS

### Participants

The participants in this study were selected from the Centers for Disease Control (CDC) Vietnam Experience study, a mid-1980s research project investigating the effects of the Vietnam experience on military veterans. Details of the original subject selection, data collection, and study methodology are described at length elsewhere.<sup>17,18</sup> To summarize, the CDC Vietnam Experience study consisted of 45,813 randomly selected

male U.S. Army veterans who had served during the Vietnam era and who met the following criteria: (1) first entered the military between January 1965 and December 1971; (2) served at least 4 months of active duty; (3) served only one tour of duty; (4) earned a military occupational subspecialty other than "duty soldier" or "trainee;" and (5) had a pay grade of E-5 or lower at discharge (i.e., enlisted, noncommissioned with a rank of sergeant or lower, including those with less than honorable discharges). From this overall sample, a random subsample of 15,288 veterans completed a structured questionnaire via telephone interview. Of these telephone interviewees, another random subsample of 6443 subjects was invited to complete a series of medical, psychologic, laboratory, and interview-based evaluations over 3 days. The current study used data gathered from the 4462 veterans who completed those evaluations.

### Derivation of Comparison Groups

First, subjects who had missing or inconsistent data were excluded. Next, veterans who had sustained a concussive head injury were excluded, due to the confounding effects of head injury on cognitive functioning. The final sample of 4112 individuals ranged in age from 31 to 49 years of age at the time of the CDC Vietnam Experience Study (i.e., the 1980s). From this pool of 4112 participants, four groups of 84 cases were derived based on the diagnostic results of the Diagnostic Interview Schedule, Version III-A (DIS-III-A).<sup>19</sup>

The DIS-III-A is a standardized interview that assesses the presence of psychiatric disorders based on the diagnostic criteria laid out by the Diagnostic and Statistical Manual of Mental Disorders-Third Edition (DSM-III, 1980).<sup>20</sup> Diagnoses of major depressive disorder, generalized anxiety disorder, somatization disorder, alcohol abuse/dependence, substance abuse/dependence, and post-traumatic stress disorder (PTSD) were based on symptoms during the year before assessment. The diagnosis of ASPD was based on

lifetime symptom history. It should be noted that although the criteria used to diagnose ASPD on the DIS-III-A were based on a previous version of DSM (DSM-III from 1980), the criteria are quite similar in those is the more recent DSM-IV.<sup>921</sup> Notable differences in the DSM-IV criteria for ASPD include (A) the deletion of two criteria (i.e., irresponsible parenting and failure to maintain a monogamous relationship); (B) the combination of two criteria (i.e., failure to maintain consistent work behavior and failure to honor financial obligations) into one item (consistent irresponsibility); and (C) a simplification of the described relationship of ASPD to conduct disorder.

### Antisocial Personality Disorder Active Symptomology Group (ASPD-Active)

In an effort to clearly identify whether current ASPD pathology, rather than simple lifetime prevalence of ASPD, was related to neuropsychological functioning (i.e., any positive findings), two ASPD groups were derived. One group, ASPD Active Symptomology Group (ASPD-Active), was composed of veterans who met diagnostic criteria for lifetime prevalence of ASPD based on the DIS-III-A and who had clinical profiles on the Minnesota Multiphasic Personality Inventory (MMPI)<sup>21</sup> consistent with ASPD. These included 4-9 or 9-4 code-types (where T-scores were  $\geq 65$  on scales 4 and 9) or "spike 4" profiles (where the scale 4 T-score was  $\geq 70$  and was at least 10 points higher than any other scale). Only valid MMPI profiles were used. Based on previous reports suggesting that such elevations are consistent with ASPD<sup>10</sup> these profile configurations were interpreted as representing active antisocial personality traits and behaviors. A total of 84 veterans met these criteria.

### Antisocial Personality Disorder Inactive Symptomology Group (ASPD-Inactive)

From the remaining 904 individuals who met DIS-III-A criteria for lifetime prevalence of ASPD, but did not have elevated

4-9/9-4 or “spike 4” profiles on the MMPI, we randomly selected 84 participants for the ASPD-Inactive group. The two ASPD groups were comparable in age, race, education level, and scores at enlistment on the General Technical Test (GTT).<sup>23</sup> The GTT is a brief measure of general cognitive functioning and aptitude made up of the verbal reasoning and arithmetic reasoning subtests of the Army Classification Battery.

### Psychiatric Control Group

To determine whether any positive results might be associated simply with having a psychiatric disorder not specific to ASPD, a psychiatrically-matched control (PC) group of 84 veterans was selected from all individuals who met DSM-III criteria for one or more psychiatric conditions other than ASPD ( $n = 936$ ). Psychiatric control subjects were selected on a case-by-case basis to match each ASPD-Active individual on psychiatric conditions present at the time of interview. In other words, if an ASPD-Active participant met DSM criteria for depression and alcohol abuse, the psychiatric control “match” also had depression and alcohol abuse, but not ASPD. The PC group was comparable in age, education, race, income level, and enlistment GTT score to the ASPD-Active group.

### Normal Control Group

To be able to determine whether any positive findings associated with ASPD or other psychiatric condition were caused by demographic characteristics, a demographically-matched comparison group of 84 veterans who had no psychiatric diagnoses was selected from the remaining sample ( $n = 2537$ ). The normal control subjects (NC) were matched on a case-by-case basis to be as similar as possible to the ASPD-Active group on age, education, race, income level, and enlistment GTT score.

In sum, the four groups used for all subsequent analyses were: (A) ASPD diagnosis plus MMPI elevations (ASPD-Active;  $n = 84$ ); (B) ASPD diagnosis without clinically signifi-

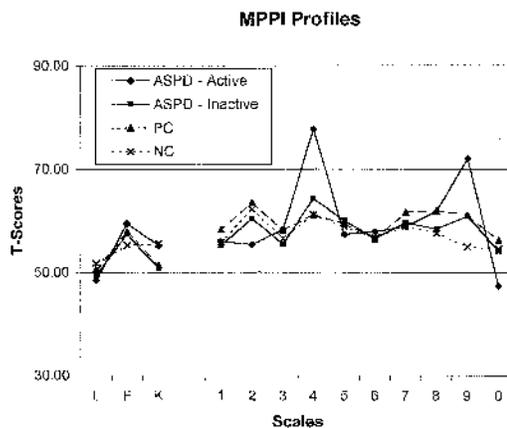
cant MMPI elevations (ASPD-Inactive;  $n = 84$ ); (C) psychiatric control (PC;  $n = 84$ ); and (D) normal control (NC;  $n = 84$ ). Mean MMPI profiles for the four groups are presented in Figure 1. Tables 1 and 2 present information about demographics and comorbid psychiatric diagnosis for the four groups.

### Neuropsychological Measures

In addition to the DIS-III-A and MMPI, the original evaluations done in the 1980s included a medical history and examination, and neuropsychological testing of global intellectual functioning and other specific cognitive abilities for all subjects. Assessments were conducted by trained examiners.<sup>17,18</sup>

### Measures of General Intellectual Ability

General intellectual ability was assessed with the Information and Block Design subtests of the Wechsler Adult Intelligence Test-Revised (WAIS-R),<sup>24</sup> and with the GTT<sup>23</sup> as described previously. GTT scores are reported in the same metric as a standard Intelligence Quotient (IQ) score with a mean of 100 and standard deviation of 15. Previous research<sup>17,18</sup> has suggested that performance on the GTT is highly correlated with general intellectual ability. For all participants, two GTT scores were available: one obtained at their induction into the military (GTT-pre)



**FIGURE 1.** Mean MMPI profiles for ASPD and comparison groups. ASPD-Active, ASPD with MMPI elevations; ASPD-Inactive, group without MMPI elevations; PC, psychiatric control group; NC, normal control group.

TABLE 1. Demographic information of study participants by group

Characteristic	Group							
	ASPD-Active (n = 84)		ASPD-Inactive (n = 84)		PC (n = 84)		NC (n = 84)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Age (years)	37.67	(2.43)	37.63	(2.43)	37.43	(2.31)	37.68	(2.42)
Education (years)	12.85	(2.11)	12.92	(2.01)	12.70	(1.78)	12.86	(1.97)
GTT-pre	105.10	(18.47)	104.04	(18.38)	100.81	(18.78)	104.15	(18.42)

ASPD-Active, ASPD group with MMPI elevations; ASPD-Inactive, ASPD without MMPI elevations; PC, psychiatric control group; NC, normal control group; GTT, general technical test score at enlistment.

and one obtained as part of the CDC Vietnam Experience Study (GTT-current) roughly 16 years later.

#### Measures of Executive Functioning

As executive functioning involves a number of different specific abilities, several

tests of executive functioning were included. Trial 1 of the Paced Auditory Serial Addition Test (PASAT)<sup>25</sup> was included as a measure of sustained attention and working memory. The Controlled Oral Word Association Test (FAS)<sup>26</sup> was included as a measure of mental productivity and perseverance. The number

TABLE 2. Other demographic variables and concomitant psychiatric diagnoses by group

Characteristic	Group							
	ASPD-Active (n = 84)		ASPD-Inactive (n = 84)		PC (n = 84)		NC (n = 84)	
	Percent	(n)	Percent	(n)	Percent	(n)	Percent	(n)
Race								
White	77.4	(65)	84.5	(71)	77.4	(65)	77.4	(65)
Black	14.3	(12)	10.7	(9)	15.5	(13)	15.5	(13)
Hispanic	7.1	(6)	3.6	(3)	6.0	(5)	7.1	(6)
Asian	1.2	(1)	0.0	(0)	1.2	(1)	0.0	(0)
Other	0.0	(0)	1.2	(1)	0.0	(0)	0.0	(0)
Annual Income 1984								
<\$5000	2.4	(2)	4.8	(4)	2.4	(2)	2.4	(2)
\$5000-\$10000	15.9	(13)	6.0	(5)	10.7	(9)	6.0	(5)
\$10001-\$20000	22.0	(18)	21.7	(18)	23.8	(20)	32.1	(27)
\$20001-\$30000	29.3	(24)	26.5	(22)	32.1	(27)	26.2	(22)
\$30001-\$40000	15.9	(13)	18.1	(15)	19.0	(16)	14.3	(12)
\$40001-\$50000	3.7	(3)	9.6	(8)	6.0	(5)	14.3	(12)
>\$50000	11.0	(9)	13.3	(11)	6.0	(6)	4.8	(4)
Depression Dx, past yr	8.3	(7)	4.8	(4)	7.1	(6)	0.0	(0)
Somatization Dx, past yr	1.2	(1)	1.2	(1)	1.2	(1)	0.0	(0)
GAD Dx, past yr	13.1	(11)	15.5	(13)	13.1	(11)	0.0	(0)
ETOH Abuse/depend past yr	36.3	(29)	28.0	(23)	38.1	(32)	0.0	(0)
Drug abuse/depend past yr	22.6	(19)	9.5	(8)	13.1	(11)	0.0	(0)
PTSD Dx, past yr	9.5	(8)	7.1	(6)	9.5	(8)	0.0	(0)

ASPD, ASPD-Active, ASPD with MMPI elevations; ASPD-Inactive, group without MMPI elevations; PC, psychiatric control group; NC, normal control group; Depression Dx, last yr, diagnosis of depression within the last year; Somatization Dx, last yr, Diagnosis of somatization within the last year; GAD Dx, last yr, Diagnosis of generalized anxiety disorder within the last year; ETOH abuse/depend last yr, Diagnosis of alcohol abuse/dependence within the last year; Drug abuse/Depend last yr, diagnosis of drug abuse/dependence within the last year; PTSD Dx, past year, diagnosis of combat-related posttraumatic stress disorder within the last year.

of sorts achieved and the ratio of perseverations to cards sorted on the Wisconsin Card Sorting Test (WCST)<sup>27,28</sup> were used as measures of problem-solving skill and cognitive flexibility. Finally, total intrusion and perseveration error scores from the California Verbal Learning Test (CVLT)<sup>29</sup> were used as measures of self-monitoring and self-control. Each of these tests is commonly used and psychometrically sound measures of behaviors that are considered to be executive in nature, such as planning, purposeful action, and effective self-monitoring of performance.<sup>30,31</sup>

### Other Neuropsychological Measures

Nonexecutive cognitive abilities were also examined. General language and semantic fluency was measured by the total number of responses on the Animal Naming test.<sup>32</sup> Visual cognitive ability was assessed by performance on the copy of the Rey-Osterrieth Complex Figure Drawing (Rey-O).<sup>33</sup> The delayed free recall of the Rey-O assessed visual memory ability. Immediate and delayed verbal memory were assessed by the following CVLT<sup>29</sup> subtest scores: total correct words in trials 1 through 5, total correct words on List B, total correct words on the Short-Delay Free Recall test, and total correct words on the Long-Delay Cued Recall test. Motor functioning was assessed by dominant and non-dominant hand speed on the Grooved Pegboard Test (GPT).<sup>34</sup>

### Statistical Analysis

The four groups were compared on categorical demographic variables using contingency table analyses with the  $\chi^2$  statistic. Analysis of variance (ANOVA) was used to compare groups on demographic variables. With respect to the dependent neuropsychological variables of interest, the general analytic strategy involved the use of a multivariate analysis of variance (MANOVA) with planned post-hoc ANOVAs for any statistically significant MANOVA results. Finally, change in general cognitive functioning from time of enlistment to time of evaluation was

investigated with a mixed-model ANOVA. A statistically significant interaction between the within-subject measure (GTT-pre and GTT-current) and group membership (ASPD-Active, ASPD-Inactive, PC, NC) would indicate differential change across time by group with respect to general cognitive ability.

## RESULTS

### Demographic Characteristics

Means and standard deviations for all demographic variables included in the analyses are presented in Tables 1 and 2. The four groups did not statistically significantly differ in age ( $F(3,332) = 0.20, p = 0.90$ ), education, ( $F(3,332) = 0.18, p = 0.91$ ), or GTT-pre score ( $F(3,332) = 0.85, p = 0.47$ ). They also were comparable on race ( $\chi^2(12, N = 336) = 7.52, p = 0.82$ ) and income level ( $\chi^2(18, N = 336) = 21.83, p = 0.24$ ). Ninety percent or more of the subjects in each group received an honorable discharge from the military. Less than honorable discharges were also comparable for all groups (ASPD-Active = 10%, ASPD-Inactive = 9%, PC = 5%, NC = 5%). We also performed cross tab analyses with chi square statistics and found no difference among the four groups on medical conditions including diabetes, hypertension, heart murmur, angina, myocardial infarction, heart failure, and peripheral vascular disease ( $p > 0.26$  for all).

### Psychiatric Matching Characteristics

Comorbid psychiatric matching characteristics of the four groups are presented in Table 2. Based on the case-by-case matching procedure, the ASPD-Active and the PC groups were comparable on all comorbid diagnoses other than ASPD ( $\chi^2(1, N = 168) < 2.60, p > 0.16$ ; for all diagnoses).

### Neuropsychological Results

Means and SDs of the neuropsychological measures are presented in Table 3. SPSS sample power was used to compute the power necessary to detect a medium effect size (defined as 0.25). Depending on the

TABLE 3. Neuropsychological test performance across group

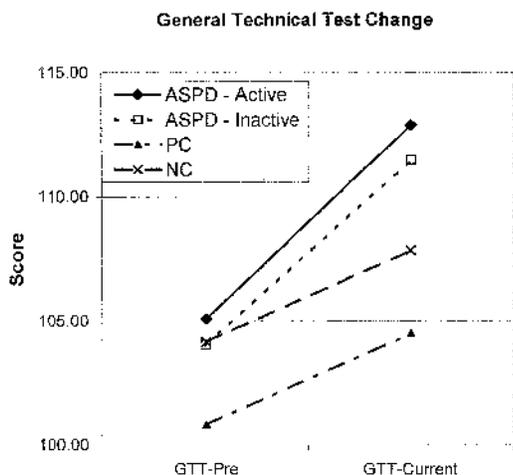
Measure	Group							
	ASPD-Active (n = 84)		ASPD-Inactive (n = 84)		PC (n = 84)		NC (n = 84)	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Executive measures								
PASAT								
Trial 1, correct responses	40.86	(8.45)	40.13	(8.59)	36.69	(10.45)	40.11	(10.08)
Memory errors								
Total perseverations	7.69	(7.38)	7.36	(5.60)	7.70	(6.14)	7.94	(6.40)
Total intrusions	5.33	(6.23)	4.70	(5.15)	6.23	(6.63)	5.08	(5.56)
Word list generation tasks								
FAS Total words	37.39	(9.86)	36.74	(9.93)	34.29	(10.82)	34.40	(10.75)
WCST								
Number of sorts achieved	5.52	(1.15)	5.39	(1.26)	5.30	(1.27)	5.12	(1.67)
Ratio perseverations/cards	0.14	(0.12)	0.14	(0.13)	0.17	(0.13)	0.16	(0.16)
Nonexecutive measures								
WAIS-R								
Information, age scale score	10.31	(2.51)	9.88	(2.62)	9.33	(2.64)	9.46	(2.93)
Block Design, age scale score	10.25	(2.49)	10.48	(2.44)	9.70	(2.81)	10.51	(2.71)
GTT-current	112.90	(17.32)	111.49	(20.13)	104.71	(19.35)	107.84	(22.60)
Semantic fluency								
Animals total words	21.86	(6.07)	21.11	(4.34)	19.75	(4.87)	20.19	(5.61)
CVLT								
Total correct, trials 1-5	47.43	(8.72)	48.08	(9.43)	44.14	(7.96)	46.17	(7.77)
Total correct, List B	5.56	(1.77)	5.74	(2.03)	5.49	(1.70)	5.33	(1.53)
Total correct, LD Cued	11.02	(2.67)	11.26	(2.61)	9.90	(2.52)	10.48	(2.42)
Total correct, LD Recog	14.19	(1.70)	14.06	(1.62)	13.94	(1.65)	13.99	(1.76)
Rey-Osterrieth complex figure								
Drawing copy-total	32.64	(3.04)	33.46	(2.19)	32.08	(3.65)	32.63	(3.91)
Delayed memory recall	19.30	(5.70)	21.35	(6.25)	19.33	(5.70)	19.47	(6.42)
Grooved Pegboard Test, total seconds								
Dominant hand	72.73	(10.64)	71.90	(8.74)	74.30	(12.78)	72.58	(13.21)
Non-dominant hand	79.58	(15.54)	76.87	(12.06)	79.19	(15.89)	75.98	(13.84)

*Note.* ASPD-Active = ASPD with MMPI elevations; ASPD-Inactive = ASPD group without MMPI elevations; PC = Psychiatric Control group; and NC = Normal Control group; PASAT = Paced Auditory Serial Addition Test; WCST = Wisconsin Card Sorting Test; FAS = Controlled Oral Word Association Test; WAIS-R = Wechsler Adult Intelligence Test - Revised; GTT-current = General Technical Test Score; CVLT = California Verbal Learning Test; LD = Long Delay.

analysis, power ranged from 0.80 to 0.98. The four groups were not statistically significantly different on the neuropsychological measures of executive functioning (Wilks' Lambda = 0.938;  $F(18,925) = 1.18, p = 0.27$ ).

Means and SDs for nonexecutive cognitive measures are also presented in Table 3. Again, MANOVA results indicated no statistically significant differences between the four groups on tests of nonexecutive cognitive abilities (Wilks' Lambda = 0.868;  $F(36,949) = 1.29, p = 0.12$ ).

Finally, a mixed-model ANOVA was conducted to examine differential rates of change in GTT score from enlistment to time of evaluation. The interaction among groups was statistically significant ( $F(3330) = 3.78, p < 0.02$ , Eta Squared = 0.033). As illustrated in Figure 2, all four groups improved in GTT performance from enlistment to follow-up. Pairwise group comparisons revealed that the two ASPD groups had a similar rate of improvement on GTT score ( $F(1165) = 0.04, p = 0.85$ ) and both groups improved more



**FIGURE 2.** General technical test (GTT) standard scores for ASPD and comparison groups from the time of military enlistment (GTT-Pre) to follow-up evaluation (GTT-Current). ASPD-Active, ASPD with MMPI elevations; ASPD-Inactive, group without MMPI elevations; PC, psychiatric control group; NC, normal control group.

than the psychiatric controls ( $F(1165) = 6.18, p < 0.02$  for ASPD-Active;  $F(1165) = 4.00, p < 0.03$  for ASPD-Inactive) and the normal controls ( $F(1165) = 6.39, p < 0.02$  for ASPD-Active; for  $F(1165) = 5.16, p < 0.03$  ASPD-Inactive).

## CONCLUSIONS

The purpose of the current study was to examine the relationship between ASPD and cognitive functioning while carefully controlling demographic and psychiatric factors. In particular, the relationship between ASPD and executive problems was examined. Results indicated that individuals with ASPD do not perform more poorly than either psychiatric or normal controls on measures of executive functioning or other cognitive abilities (i.e., language, memory, visuospatial and motor abilities).

The current study was also intended to rectify certain methodological limitations of past research such as small sample sizes, poorly defined diagnostic classifications, and failure to use adequately matched control groups. Here, a large sample of veterans was

used, and subjects displayed varying levels of current ASPD symptoms (based on DIS-III response and MMPI profiles). In addition, control subjects were individually matched to ASPD participants on comorbid psychiatric and substance abuse conditions and on important demographic variables. The careful matching procedure used in the current study affords us more confidence to conclude that individuals with ASPD diagnoses do not differ in executive functioning from individuals with different psychiatric problems or from individuals without any psychiatric conditions.

Previous research on incarcerated ASPD subjects found no deficits in executive functioning associated with ASPD *per se*.<sup>7,8,13</sup> Our findings replicated those results in a nonincarcerated community sample of individuals with ASPD. The convergence of these findings suggest that executive dysfunction (i.e., frontal lobe dysfunction) is not a core element in antisocial personality disorder as hypothesized by others. These findings also parallel the lack of executive deficits found by Hare<sup>7</sup> in psychopathic subjects, which raises the possibility that a similar mechanism or etiology underlies both psychopathy and antisociality. This hypothesis has been suggested by others as well. For example, Mealey proposed an integrated evolutionary model of psychopathy in which a complex interaction of genetic and physiological risk factors along with specific demographic and environmental contexts result in an increased prevalence of antisocial behavior in populations.<sup>35</sup> As cognitive deficits do not appear to be significantly related to ASPD, emotional or socialization factors, such as values or other subcultural norms, may have stronger explanatory power regarding the aggressive, impulsive, irresponsible, and unlawful behaviors of ASPD individuals. Additional research into these variables is needed.

Antisocial traits as outcome behaviors can be arrived at by a variety of pathways. Morgan and Lilienfeld's work<sup>15</sup> suggest that some etiologies of antisocial behavior are re-

lated to impaired executive functioning, while ASPD is not. However, their finding that executive skills deficits are associated with such heterogeneous classifications as "criminality" or "delinquency"<sup>15</sup> offers little clarification about which etiologies of antisociality are linked with these cognitive deficits. The current study was one step toward this clarification. The finding of no statistically significant cognitive dysfunction in community-based ASPD supports the idea that executive dysfunction is differentially present in antisocial individuals depending on the etiology of those antisocial traits and behaviors. However, further research with other narrowly defined antisocial groups is needed to more fully map out these differences. This process could also help uncover additional variables that may currently be hidden within the heterogeneity of classifications like "criminality."

An interesting incidental finding in the current study was that, from military enlistment to follow-up testing approximately 16 years later, both ASPD groups improved in general intellectual functioning (i.e., on the GTT) more than either control group. One possible explanation for this finding is that individuals diagnosed with ASPD in this study were academic underachievers as adolescents (i.e., at the time of their induction to the military) perhaps because of various behavioral problems. Over the subsequent 16 years, these individuals may have overcome earlier difficulties through the inevitable maturational process and reached a level of cognitive performance that was closer to their "true" cognitive potential. Even individuals with active ASPD symptoms at follow-up demonstrated improvement in their general intellectual functioning across the 16-year interval. This supports the earlier conclusion that cognitive deficits and ASPD-related antisocial behavior are unrelated, but contradicts the conclusions of Morgan and Lilienfeld.

In terms of limitations of the current study, the number of measures of executive functioning and other cognitive skills was somewhat limited. It is possible that other

measures of inhibitory control, planning, or judgment may have revealed some specific executive deficits that were not detected by the present battery. This could also be true of measures designed to assess nonexecutive domains. However, the greater overall improvement in cognitive functioning across time in the ASPD groups compared with the control groups makes this possibility unlikely.

The results of the current study clarify the heretofore disparate results regarding executive functioning deficits in individuals with ASPD and extend previous findings by also examining the presence of other cognitive abilities in ASPD. These findings may prove useful to clinicians who treat individuals with ASPD. Clients with ASPD often have clinically significant and chronic problems with poor anger control, lack of empathy and/or remorse, irresponsibility, and impulsivity which can impede successful treatment. Yet, the current findings indicate that individuals with ASPD may be more cognitively capable of executing behaviors that require planning skills, purposeful action, awareness, and abstract reasoning than previously believed. It seems more accurate, as well as more helpful, for clinicians to conceptualize the ASPD patient's problems as being more emotionally based and/or socially reinforced than cognitive in origin. In turn, this may help clinicians channel their therapeutic efforts to these potentially more malleable domains in hopes of effecting behavioral change.

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