

Antisocial personality disorder as a predictor of criminal behaviour in a longitudinal study of a cohort of abusers of several classes of drugs: Relation to type of substance and type of crime

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Abstract

Mixed findings have been made with regard to the long-term predictive validity of antisocial personality disorder (ASPD) on criminal behaviour in samples of substance abusers. A longitudinal record-linkage study of a cohort of 1052 drug abusers admitted 1977–1995 was undertaken. Subjects were recruited from a detoxification and short-term rehabilitation unit in Lund, Sweden, and followed through criminal justice registers from their first treatment episode to death or to the year 2004. In a ML multinomial random effects regression, subjects diagnosed with antisocial personality disorders were 2.16 times more likely to be charged with theft only ($p < 0.001$), and 2.44 times more likely to be charged committing multiple types of crime during an observation year ($p < 0.001$). The findings of the current study support the predictive validity of the DSM-III-R diagnosis of ASPD. ASPD should be taken seriously in drug abusers, and be targeted in treatment to prevent crime in society.

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1. Introduction

Crime and drug abuse go together. Miller and colleagues estimated that 5.4 million violent crimes and 8 million property crimes involved alcohol and other drugs use in the USA in 1999 (Miller, Levy, Cohen, &

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Cox, 2006). Drug users report greater involvement with crime than non-users, and are more likely to have criminal records. Persons with criminal records are much more likely to be drug users than others. Among Swedish drug users identified in the criminal justice system, the majority have been sentenced for a non-drug offence, such as theft or violence (Wittrock, 2006).

Alcohol abuse precedes or accompanies a large proportion of violent crime (Gorman, Speer, Labouvie, & Subaiya, 1998; Rossow, 2001; Scribner, Cohen, Kaplan, & Allen, 1999; Scribner, MacKinnon, & Dwyer, 1995).

Several mechanisms may explain these associations. Drug users may be involved in crime to obtain money for drugs; drug users may also commit crime under the influence of drugs; and drug users, or a subset of drug users, may share characteristics that predispose them to criminal behaviour, such as antisocial personality disorder (ASPD).

Table 1
Studies on the longitudinal association between ASPD and crime in substance abusers

Reference	Treatment	N/n with ASPD	Diagnostic approach	Follow-up time	Follow-up data collection	Key findings
Alterman et al., 1996	MMT and counselling	184/59	SCID-II	7 months	Self-report	ASPD less criminal
Alterman et al., 1998	MMT	193 ^a	Various	7 months	Self-report	Non-significant findings
Bell et al., 1997	MMT	304 ^a	DIS	12 months	Self-report	ASPD symptom count associated with criminal involvement
Bovasso et al., 2002	MMT	254 ^a	PDE	2 years	Criminal justice records	ASPD not associated with crime, after controlling for psychopathy and socialization
Grella et al., 2003	Mixed drug free	707/291	DIS	5 years	Self-report	Higher level of criminal involvement for ASPD, no time*ASPD effect
Hernandez-Avila et al., 2000	Mixed drug free	276/75	SCID-II	12 months	Self-report	No significant effects reported
Kranzler et al., 1997	Mixed in- and outpatient	100/23	LEAD	6 months	Self-report	ASPD predicted days in jail, but not ASI legal problems
McKay et al., 2000	Drug free aftercare	127/46	PDE	12 months	Self-report	No differences reported — low level of criminal involvement for all subjects
Messina et al., 1999	TC	338/166	SCID-II	19 months	Criminal justice records	Fewer arrests among ASPD+ subjects
Verheul et al., 1999	Mixed alcoholism treatment	309/95	CIDI	14 months	Self-report	Small, non-significant difference indicating higher level of legal problems among ASPD+ subjects

Notes: MMT: Methadone Maintenance Treatment. SCID-II: The Structured Clinical Interview for the DSM-III-R. DIS: Diagnostic Interview Schedule. PDE: Personality Disorder Examination. CIDI: Composite International Diagnostic Interview. LEAD: Longitudinal Expert All Data method.

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$.

^a N with ASDP not reported.

ASPD and crime have been studied in a number of studies of drug abusers (Alterman & Cacciola, 1991; Alterman, Rutherford, Cacciola, McKay, & Boardman, 1998; Alterman, Rutherford, Cacciola, McKay, & Woody, 1996; Bell, Mattick, Hay, Chan, & Hall, 1997; Bovasso, Alterman, Cacciola, & Rutherford, 2002; Grella, Joshi, & Hser, 2003; Hernandez-Avila et al., 2000; Kranzler, Tennen, Babor, Kadden, & Rounsaville, 1997; McKay, Alterman, Cacciola, Mulvaney, & O'Brien, 2000; Messina, Farabee, & Rawson, 2003; Messina, Wish, Hoffman, & Nemes, 2002; Messina, Wish, & Nemes, 1999; Verheul, van den Brink, Koeter, & Hartgers, 1999).

Some studies have found ASPD to predict criminal behaviour following treatment (Bell et al., 1997; Grella et al., 2003; Kranzler et al., 1997; Verheul et al., 1999). However, other studies have reported no association with crime (Alterman et al., 1998; Bovasso et al., 2002; Hernandez-Avila et al., 2000; McKay et al., 2000; Messina et al., 1999).

Several factors could account for these inconsistent findings. Reporting bias or publication bias could lead to under-reporting of negative findings, or the actual relationship between ASPD and crime may be small (Clarke & Oxman, 2002). However, some of the studies reporting positive findings have been relatively large studies (e.g., Grella et al., 2003).

These mixed findings could lead to doubt concerning the validity of diagnoses, and raise the possibility that the diagnosis of ASPD in substance abusers is a diagnostic artefact. ASPD may be misdiagnosed, because substance-related problems cause fluctuating symptoms that mimic, but are not, ASPD.

However, there are limitations to this literature. Many studies rely on self-reported crime and have short follow-up times for relatively rare events such as being sentenced to prison. Often follow-up times are less than 3 years (see Table 1).

We recently published reports on crime for a consecutive sample from this institution admitted between 1988–1989 based on data from the criminal justice register in Sweden (BRÅ) and self-report (Fridell, Hesse, & Johnson, 2006). In that study we found that subjects with a diagnosis of ASPD, based on clinical observation, were substantially more criminally active than substance abusers without such a diagnosis. We also found that the diagnosis based on clinical observation was in fair agreement with SCID-II diagnoses of ASPD and borderline personality disorder (Fridell & Hesse, 2006). In order to more specifically assess which types of crime are related to ASPD, we therefore analyzed data on the full cohort of patients who were treated in the unit between 1977 and 1995 (see below).

2. Methods

The current study employed a longitudinal design to assess the impact of ASPD over a 30-year period. We were able to obtain complete data for the period 1973–2004.

2.1. Setting

The setting was an 18-bed detoxification and short-term rehabilitation unit at St. Lars Hospital, the larger of two units in Southern Sweden. Within a large catchment area of Southern Sweden (Skaane), the St. Lars unit was the only available inpatient detoxification unit for substance abusers, with the exception of a small unit with intake from the town of Helsingborg. Therefore, the St. Lars unit served almost all patients requiring inpatient detoxification in the entire region. The period covered by the study ran from 1977 to 1995. At the start of the period, a national case finding study identified approximately 1500 illicit drug abusers

living in the region of Skaane ([Heavy Drug Use, 1980](#)). Treatment for all types of drug abuse was offered in the unit.

Urine testing was conducted at least two times per week, and when staff suspected drug use.

The staff at the unit included psychiatrist, physician, psychologist, nurses, and caretakers. Medication-assisted detoxification was provided, and patients were given supportive care and group and individual counselling. Clonidine was used for detoxification from opiates, while methadone was used in more severe cases. In the treatment of benzodiazepine, tranquilizer and analgetic dependence, the substances were tapered. Detoxification from cannabis and amphetamine was drug free. Treatment objectives were made for each treatment episode and could range from detoxification to full rehabilitation with aftercare.

Patterns of admissions varied very little over time. There were no changes in referral policy, but substances used fluctuated slightly over the period.

2.2. *Subjects*

The subjects were consecutively admitted patients to the hospital between 1976 and 1995 ($N=1052$). All subjects admitted were included, regardless of length of stay.

2.3. *Data collection*

Diagnoses of personality disorders at intake were made only after patients were detoxified. The diagnostic process followed a triangulation process. Personality disorders have routinely been diagnosed in the unit since the release of the DSM-III in 1980 and re-evaluated upon the introduction of DSM-III-R in 1987. In 1980 and 1987, after the publication of the diagnostic manuals, all patients' case files were reviewed, and discussed by the responsible clinicians at the unit's diagnostic conferences. The process of diagnosing personality disorders involved a clinical intake interview, multiple observations of the patient over several admissions, information from outpatient counselling centres working in liaison with the unit, other psychiatric units, and information from referral agents and significant others. Each criterion for each personality disorder in the DSM-III-R was carefully considered against all available data. Up to three personality disorder diagnoses were recorded in the database. Other information, such as sources of support at intake, and whether or not the patient was living with a spouse, was also recorded.

An analysis of the degree of agreement between the diagnoses based on clinical observation with those based on SCID-II interviews for 138 subjects who were included in studies in 1990–1992 showed that ASPD was in fair agreement with SCID-II diagnoses ($\kappa=0.49$), and any personality disorder was in fair agreement ($\kappa=0.48$) ([Fridell & Hesse, 2006](#)). A five year follow-up of the sample showed that the ASPD diagnoses made between 1988 and 1989 were highly predictive of criminal behaviour, continued drug abuse, and failure to be self-supported ([Fridell et al., 2006](#)). Based on these analyses, it was decided that ASPD personality disorder could be considered a valid diagnosis.

We coded DSM-III-R diagnoses, primary substance of use, whether treatment was completed, gender, dates of admission and discharge from the treatment unit, and other relevant clinical data. Completed treatment required two successive drug free urine samples and the completion of predefined treatment goals based on Goal Attainment Scaling ([Lewis, Spencer, Haas, & DiVittis, 1987](#)).

We retrieved dates of death or migration for all patients from the National Board of Health and Welfare. Patients who died during follow-up were included in the analyses for each year until the year when death occurred.

2.4. Outcome variables

Data on criminal behaviour was collected from the National Database of Criminal Justice and was retrieved from The National Council for Crime Prevention, Stockholm, Sweden (BRÅ). We linked patients from the cohort to the crime register using their 10-digit civil registration number.

Types of crime were categorized according to the Swedish criminal justice services categorization. We selected three types of crime of special interest in connection with drug addiction. Specifically, the following categories were used:

- A. Property crimes, i.e. theft, fencing or fraud.
- B. Violent crimes, including assault, murder and manslaughter.
- C. Drug-related crimes, including smuggling.

Within a given observation year, each subject was coded as having either (1) no crime in any of the categories; (2) one or more crimes in category A, e.g., theft, and no crimes in category B or C; (3) one or more crimes in category B, i.e., violent crime, and no crimes in category A or C, (4) one or more crimes in category C, i.e., drug-related crimes and no crimes in category A or B, or (5) crimes in more than one of the categories A–C.

During the period, the penal value for substance-related offences has increased. As in most other countries in Northern Europe, prison sentences are generally shorter than in North America. Plea bargaining does not exist, and charges are never dropped in return for pointing out other involved parties. Thus, the number of offences recorded represents the number of offences that have come to police attention.

2.5. Predictors

The independent variables were: not completing detoxification, gender, age at first admission, antisocial personality disorder, absence of personality disorder, time elapsed since treatment in years, use of cannabis at intake, use of opioids at intake, use of stimulants at intake, and poly-substance use at intake.

2.6. Statistical analysis

For the estimation of determinants of criminal behaviour, we used mixed-effects multinomial logistic regression (Hartzel, Agresti, & Caffo, 2001; Hedeker, 2003; Hedeker & Mermelstein, 2000). The availability of longitudinal data allowed us to correct for unobserved individual heterogeneity determining criminal behaviour, as captured by one or more normally-distributed random effects. Observation years for an individual entailed years in which an individual was alive and not migrated.

We estimated a range of different model specifications using MIXNO (Hedeker, 1999) and the GLLMM macro for STATA (Rabe-Hesketh, Skrindal, & Pickles, 2004). For details of the independent variables, see Table 3. In model 1 we estimated the model with one single random effect

(variance term) for the 4 nominal criminal outcomes. In the model with a single random effect, only a single random effect is estimated for all criminal outcomes. The unobserved individual heterogeneity is assumed to be the same for all criminal outcomes, and separate effects are estimated only for other predictors.

In model 2 a random effect is estimated for each of the criminal outcome categories. Model 2 allows for subjects who were charged with crime of a specific type to differ on unobserved as well as on observed characteristics. Because more effects are estimated, the model is more complex, and the likelihood-ratio test to compare models 1 and 2 has 3 degrees of freedom.

Furthermore, we estimated the distribution of the random effects by non-parametric maximum likelihood methods (Skrondal & Rabe-Hesketh, 2004) to check the sensitivity of our results to parametric assumptions.

The cohort was assessed over a long period, and diagnostic procedures varied somewhat (for subjects who were only in the unit prior to 1987, diagnoses were revised retrospectively in 1987 using a combination of hospital record data, data from social services, and staff members' recollection of the patients). Therefore, we entered a dummy variable for subjects treated before 1987, and a dummy variable for the interaction of treatment by ASPD status. Descriptive statistics for specific

Table 2
Descriptive statistics

	Not ASPD	Mean(SD)	ASPD	
	<i>N</i>		<i>N</i>	
Age at first crime ^a	410	18.2(3.8)	103	16.9(2.7)
Age at first treatment	817	27.9(7.3)	228	27.5(6.0)
		<i>N</i>	<i>N</i>	%
Male*		817	228	68%
Problem drug use				
Cannabis*				25%
Opiates*				31%
Stimulants				30%
Poly-substance				38%
Treatment variables				
Drop-out before detoxification completed				30%
Drop-out before rehabilitation completed				40%
Died during follow-up				27%
		% with record		% with record
Violent crimes ^b	794	43%	223	57%
Hereof after 1st treatment		32%		47%
Property crimes		76%		90%
Hereof after 1st treatment		60%		80%
Drug-related		61%		83%
Hereof after 1st treatment		50%		68%

^a Restricted to subjects born after 1957.

^b Prevalences for specific types of crime during the entire observation period.

types of crime and number of months in crime by antisocial personality disorder were also reported (Table 2).

Vital status was determined through tax registers. The delay from migration or death to tax register update rarely exceeds one week.

3. Results

3.1. Sample description

Due to clerical errors, 7 of the 1052 patients could not be matched with the criminal justice register (0.6%). The total N for analyses was thus 1045, of which 228 had been diagnosed with ASPD. The average observation length per patient was 17.5 years (range: 1–30). The majority of patients were male (71.2%), and the average age at first admission to treatment was 27.8 years (standard deviation=7.1). Of first treatment episodes, 69% completed the detoxification, defined as the tapering of all medication, and the delivery of two consecutive drug free urine specimens. Readmissions were common, with 38% being readmitted more than one year after the first treatment admission.

Of all subjects, 23% were admitted for cannabis dependence, 37% for opiate dependence, and 31% for amphetamine and other stimulants dependence. The remaining subjects were treated for barbiturates, alcohol, solvents or other drugs. Most subjects used multiple substances in addition to their main drug (62%).

Characteristics by ASPD status are shown in Table 1. Patients with antisocial personality disorder were more likely to be male ($\chi^2(1)=22.49, p<0.0001$), to be opiate abusers ($\chi^2(1)=48.23, p<0.0001$), and less likely to be cannabis users ($\chi^2(1)=10.97, p=0.001$). No differences were found for stimulant abuse, poly-substance use or age at first admission, for the proportion that had died during follow-up, or for the proportion completing either detoxification or rehabilitation in the first treatment episode.

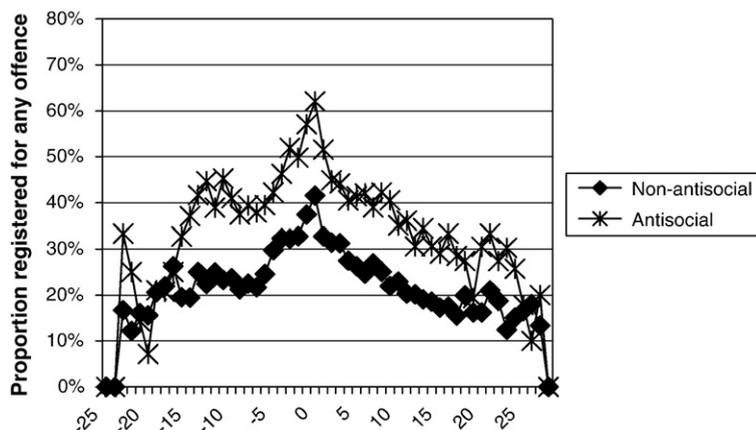


Fig. 1. Proportion registered for any offence per year by ASPD status by year. Notes: Y-axis: years relative to first treatment episode. The year 0 represents the year with the first treatment episode, years <0 represents years before first episode, and years >0 years after first treatment episode. N vary for each year: subjects are only included in an observation year if they were older than 14, and not dead in a given year.

Some level of external coercion for treatment was recorded for 37.7% of the sample, with no difference between ASPD and non-ASPD patients. Of the sample, 32.5% were living with a partner. Of the sample, 28.5% were working or studying at admission, 13.6% were mainly supported from criminal activities, including drug dealing, and 54.3% were on welfare support.

3.2. Description of criminal career before and after treatment

In total, 97% of patients with ASPD and 90% of patients without ASPD were registered in the criminal justice database during the observation period. Property crime was registered in 90% of subjects with ASPD, and in 76% of subjects with no ASPD diagnosis. Violent crimes were registered for 57% of ASPD subjects and 43% of non-ASPD subjects. Drug offences were registered for 83% of subjects with ASPD, and 61% without ASPD.

Subjects with antisocial personality disorder were charged with committing crimes in 38.7% of the observation years, and subjects without antisocial personality disorder were charged with multiple crimes in 24.7% of the observation years.

As can be seen from Fig. 1, the percentage of subjects registered in the criminal justice database was higher for subjects with ASPD than subjects without ASPD in any given year from 15 years before the first treatment episode and 20 years after. In the years prior to the first treatment episode, there was an increase in criminal involvement, peaking in the year when subjects were admitted to their first treatment episode, and

Table 3
Random effect multinomial logit model of criminal behaviour. Predictors of specific types of crime

	Theft or fraud only		Violence only		Drugs only		More than one category	
	RRR	Std.Err.	RRR	Std.Err.	RRR	Std.Err.	RRR	Std.Err.
Drop-out	*1.25	0.12	***1.42	0.14	0.98	0.09	**1.36	0.15
Female gender	***0.53	0.05	***0.33	0.04	***0.46	0.04	***0.36	0.04
Age at 1st	***0.96	0.00	***0.95	0.01	***0.96	0.00	***0.95	0.01
ASPD	***2.23	0.22	1.14	0.13	1.19	0.12	***2.44	0.29
No PD	1.05	0.11	0.86	0.11	*0.76	0.08	0.95	0.10
Cannabis	*0.76	0.09	*0.74	0.10	1.12	0.12	0.79	0.10
Opiates	***1.86	0.20	0.90	0.12	***1.86	0.20	***2.29	0.32
Stimulants	***2.59	0.28	***1.49	0.16	***1.58	0.16	***2.61	0.31
Poly-substance	***1.11	0.10	1.09	0.11	1.02	0.09	*1.25	0.14
Time	***0.87	0.00	***0.92	0.02	***0.88	0.02	***0.89	0.01
Time ²	**1.00	0.02	1.00	0.00	***1.00	0.00	1.00	0.00
σ_u^2	***0.73	0.02	***0.31	0.04	***0.46	0.02	***0.87	0.03
ρ (ICC)	0.18		0.09		0.12		0.21	
Corr($\sigma_{u1}^2, \sigma_{u2}^2$)								
Theft or fraud only			0.13		0.34		0.44	
Violence					0.03		0.05	
Drugs							0.21	
Log-likelihood (LL)							-14,916.305	
Deviance (-2LL)							29,832.610	

Notes: RRR: Relative Risk Ratio (=exp(log-odds beta)). Std.Err.: Standard error of RRR. * $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$. Corr($\sigma_{u1}^2, \sigma_{u2}^2$): correlation between random effects.

decreasing sharply thereafter. Note that the number of observations varies and was highest around the time of admission, and decreases so that fewer subjects were included at either end of the graph.

3.3. Predictors of types of crime

In total, 13.3% of years with observed crimes did not fall under any of the pre-specified outcome categories. Of the 18,291 person by year observations, 7.75% contained an occurrence of violent crime of which 2.25% were years with violent crimes only, 10.03% contained a registration of a drug-related crime of which 4.72% were drug-related crimes only, and 20.64% of observation years contained a registration of a property-related crime of which 11.69% were property-related crimes only. In total, 9.27% of observation years contained crimes from two or more of the categories.

The effect for entering treatment before 1987 and the interaction between being treated before 1987 with ASPD did not change any of the following results, and the model is reported without these effects.

When comparing different model specifications a likelihood-ratio test (LRT) showed that model fit for the model with four random effects was significantly superior to the model with only one random effect. The log-likelihood for the model with four random effects was $-14,854.183$, the log-likelihood for the model with one random effect was $-15,000.227$, and the resulting chi-square distributed LRT test statistic was 292.09 (with 3 degrees of freedom) and statistically significant ($p < 0.001$). We therefore chose to analyze the model with four random effects. We also estimated the random effects by non-parametric maximum likelihood, but this approach did not change the substantive findings.

The results of the random effect logit models are shown in Table 3. Relationships between covariates and outcomes are reported as relative risk ratios. All types of crime were significantly negatively related to female gender, and positively related to younger age at first treatment episode, stimulant use during treatment. All types of crime declined significantly with time (see Fig. 1). Overall, 86% of males had a criminal record after treatment, compared with 75% of females. Of subjects with stimulant use during treatment, 89% had a criminal record post-treatment, in comparison with 80% of non-stimulant users.

In our model with four random effects we also report the Intra Class Correlation (ICC), here labelled. The ICC can be interpreted as the average “within-crime” correlation among subjects over time. The ICC then captures the propensity for subjects to be registered with the same type of crime over time. The ICC for the first category, theft only, was 0.13. Theft only was predicted by ASPD ($p < 0.001$), the absence of cannabis addiction ($p < 0.05$), the presence of opiate addiction ($p < 0.001$), the presence of stimulant addiction ($p < 0.001$), and history of pre-treatment criminal involvement ($p < 0.001$).

The ICC for the second category, violence only was 0.03. Violence only was predicted by the absence of cannabis addiction ($p < 0.01$), stimulant addiction ($p < 0.01$) and pre-treatment criminal history ($p < 0.01$).

The ICC for the third category, drugs only was 0.06. Drugs only was predicted by the presence of PD ($p < 0.01$), opiate addiction ($p < 0.001$), stimulant addiction ($p < 0.001$), and pre-treatment criminal involvement ($p < 0.01$).

The ICC for the final category, More than One Type of Crime during a given year was 0.18. Committing More than One Type of Crimes during a given year was predicted by ASPD ($p < 0.001$), opiate addiction ($p < 0.001$), stimulant addiction ($p < 0.001$), the absence of cannabis addiction ($p < 0.05$), poly-substance addiction ($p < 0.01$), and pre-treatment criminal history ($p < 0.001$).

The random effects in the model were modestly correlated for more than one type of crime and theft ($r = 0.45$), and theft and drugs only (0.35). The random effects for violence only were more weakly

correlated with other random effects (r violence|theft=0.12; r violence|drugs=0.03; r violence|more than one=0.05). Random effects for drugs only and more than one type of drugs were weakly correlated (0.23).

In the analyses conducted with a dummy variable for the group treated prior to 1987 and the interaction between treatment time and ASPD, ASPD remained a significant predictor of theft and multiple types of criminal behaviour. This analysis is not shown.

4. Discussion

One major finding of this study was that over a lifetime, almost all of the patients were charged with a crime at least once in their life — even of non-ASPD patients, 90% had a record. As expected, men were more criminally active than women, and younger subjects were more criminally active than older subjects. However, with regard to patterns of criminal behaviours, several significant predictors were found.

4.1. Antisocial personality disorder and crime

The main finding of this study was that patients who were diagnosed with antisocial personality disorder were more likely to be criminally active during an average follow-up period of two decades. This effect was independent of time: as no interaction between time and diagnosis was found. The relationship between ASPD and crime held after controlling for several confounders. We also found that non-ASPD subjects were criminally active, with a large majority being registered for an offence at some point during their lives. However, ASPD subjects differed in degree, by being more criminally active, more likely to commit multiple types of crimes, and being registered for theft or other property crimes.

These findings were very robust over different model specifications. The best-fitting model involved estimating separate random effects for each of the different types of crime, including committing various different types of crime in a given year. The ICC was higher for multiple types of crime, indicating that committing multiple types of crime is a more consistently recurring phenomenon for the same individuals, relative to other crime outcomes. Thus, the findings from this study indicated that being criminally active in several areas represents a separate level of severity of criminal involvement in drug abusers that can be separated from either the absence of crime or more specific patterns, such as theft only or drug crimes only. Conflicting results concerning the predictive validity of the ASPD diagnosis from previous research are likely to reflect limited sizes of data sets, and length of follow-up (see [Table 1](#)).

4.2. Substances and crime

Stimulants (in this case mainly amphetamine) were associated with crime in general, and with every subtype of crime in this study. Being under the influence of stimulants may cause impaired judgement, impulsivity and aggressiveness, leading to a range of different offences. Opiates (mainly heroin) were associated with theft and fraud, and with drug offences. It seems plausible that the main link of heroin addiction and crime is the acquisition of money for drugs. Cannabis users had a lower propensity for crime in three of four categories. Possibly, the fact that cannabis is less expensive than other drugs is one

explanatory factor. Also, it may be that cannabis users tend to lead relatively more passive lives than users of other drugs.

4.3. *Strengths and limitations*

Compared to previous research this study has several important strengths. The combination of a large cohort with a long period of observation is a central strength of this study. Furthermore, the use of data from a high quality criminal justice database reduces bias in data, and the fact that the database covers the entire country makes it very unlikely that a large number of offences committed by this group of patients were missed (excluding crimes committed abroad and crimes that have not been cleared up).

The use of a sample from a single institution, and the fact that personality disorder diagnoses were made by a single small team of clinicians, reduced both random error in the diagnosis and confounders associated with treatment received.

Despite these strengths, some limitations must be acknowledged. The diagnoses of personality disorders were based on clinical observation. However, as no structured interviews had been translated into Swedish during the first 12 years of the study, we did not have access to any other relevant instruments with which to diagnose personality disorders. We are, however, quite confident that our diagnoses are no poorer than diagnoses based on semi-structured interviews, as we earlier found acceptable concordance with antisocial personality disorder SCID-II diagnoses (Fridell & Hesse, 2006), and substantial predictive validity on a range of other indicators for antisocial personality disorder (Fridell et al., 2006).

Furthermore, the sample was diagnosed prior to the release of DSM-IV and, in principle, slightly different results might have been obtained if DSM-IV had been used — some patients may differ in their diagnoses according to the two systems. However, a strong correlation has been reported between DSM-III-R and DSM-IV diagnoses of ASPD, indicating that the two systems measure the same underlying construct (Rutherford, Cacciola, & Alterman, 1999).

5. Conclusions

This study has clearly showed that valid diagnoses of antisocial personality disorder could be made in substance abusers. Substance abusers varied substantially in both their propensity to commit crimes, as well as the pattern of crimes that they commit. Antisocial personality disorder, stimulant use, male gender, and young age were strong predictors of criminal behaviour in substance abusers.

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