HYPOTHETICAL FRAMEWORK:
FASD AND CRIMINALTY – CAUSATION OR ASSOCIATION?
THE LIMITS OF EVIDENCE-BASED KNOWLEDGE
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SUMMARY
Delinquency and criminality are common characteristics of FASD. It is widely believed that the pervasive neurobehavioral anomalies in FASD are the cause of criminality. These include impulsivity, lack of understanding of social cues and other dysfunction.

We suggest an alternative hypothesis: There is strong association between excessive alcohol intake and criminality. There is also strong heritability for both. It is equally possible that criminality among youngsters with FASD is mostly due to genetic causes.

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BACKGROUND
One of the most devastating characteristics of Fetal Alcohol Spectrum Disorder (FASD) is trouble with the law. Criminal activity is described in a significant proportion of youngsters with FASD 1. Typically, criminality has been believed to be the result of the pervasive psychopathology of FASD. Impulsivity, lack of understanding of social cues, lack of “conscience”, inability to learn from experience and from punitive actions – are all common symptoms of FASD that may lead to juvenile delinquency and criminality 2.

The objective of this hypothetical framework is to examine an alternative line of thought: that the criminality in youngsters with FASD is inheritable, and its concurrence with FASD is primarily an association and not causation.

GENETIC ASPECTS OF ALCOHOLISM AND CRIMINALITY
Over the last 25 years, a large body of scientific evidence has been developed, especially in Scandinavia, on the inheritance of alcoholism and criminality. The experimental paradigm of many of these studies involves research in adoptees and among twins that have been separated.

In 1978 Bohman linked state criminal records and official registers of alcoholics to study 2000 adoptees and their biological and adoptive parents. There was significant correlation between alcoholism in biological parents and their adopted-out sons. In contrast, criminality did not show association between biological parents and their children. Bohman concluded that “there is a genetic explanation for the development of alcoholism, but not for the manifestation of criminality.”

In 1979, Lewis and colleagues found a strong association between paternal criminality and serious medical problems in their delinquent children. On the basis of this finding the authors suggested that “the behavioral manifestations resulting from such physical illness or neglect, although they appear genetic in nature, may reflect the physical and psychological consequences of parental neglect and/or battering.”

In 1981 Bohman and colleagues reported on 913 Swedish women adopted by non-relatives at an early age. They found a threefold excess of alcohol abusers among the adopted daughters of alcoholic biological mothers. In addition, they detected an excess of alcohol abuse among the daughters of biological fathers with alcohol abuse that was mild and not associated with criminality. In contrast, fathers with extensive treatment for
both alcoholism and criminality did not have excess of alcoholic daughters. Imitation of alcohol abuse by adoptive parents did not increase later alcohol abuse by adopted women.\footnote{5} A year later Martin and colleagues showed that among 66 female felons unselected for psychiatric referrals, 31 (47\%) were diagnosed alcoholics. This rate, they stated, was similar to that found among male criminals, in contrast to the fact that in most population-based studies male alcoholics far outnumbered women alcoholics. Alcoholism was associated in this study with antisocial personality.\footnote{6}

In 1983 Rydelius reported the results of interviews with 1004 18-year-old boys from the general population in Stockholm. There was a subgroup of 4\% of boys with a high consumption of alcohol, simultaneous use of drugs and criminal behavior. The author stated that “as a group, these boys had been brought up in emotionally disturbed homes, with alcoholic parents, and they also showed personality features indicating psychopathy.”\footnote{7}

In 1984 Gurling and colleagues from the UK studies 74 twin pairs with alcoholic probands. Among the 148 twins, 21\% (32/148) had non-alcohol, non-traffic offenses on record. Of those, 28 were alcoholic probands. Pairwise concordance for criminality was found in only one monozygotic and 2 dizygotic twins.\footnote{8}

In 1987 Bohman and colleagues reported on the continuation of their work, this time on 862 men and 913 women adopted by non-relatives.\footnote{9} Both male and female adoptees were at greater risk to develop alcohol abuse if their biological, but not their adoptive parents, were alcoholics. The authors defined three types of families with alcoholism that differed in frequency of alcohol abuse, somatogorm disorders in women, and antisocial behavior among male adoptees. The combination of both genetic and environmental risk factors was necessary for developing alcoholism in the most common, milieu-limited type of alcoholism. In families with a less common, male limited, type of vulnerability, alcohol abuse was highly heritable in men, but women had multiple somatic complaints but seldom alcohol abuse. In the third type, the common vulnerability was expressed as antisocial behavior with violent criminality and recurrent alcohol in males, but as high frequency somitization in female relatives.

Further examining sex differences in criminality, Baker and colleagues reported in 1989 on sex differences in property crime in a Danish adoption cohort.\footnote{10} In a cohort of 6129 male and 7065 female adoptees and their biological and adoptive parents, both genetic and environmental factors contributed to liability to property criminality. Similar correlation was found for both males and females.

Convicted females appeared to be more genetically predisposed than convicted males, based on the finding that female property offenders were more likely than male offenders to have a convicted biological (but adopted away) offspring.\footnote{10}

The same year, Mannuzza and colleagues in New York showed in a prospective study of 103 males aged 16 to 23 years diagnosed with attention deficit disorders (ADHD) and 100 normal controls, that childhood ADHD is a risk factor for later criminality “but that this relationship is almost exclusively mediated by the development of an antisocial disorder in early adulthood.”\footnote{11}

In 1995, Lyons and colleagues of Boston University compared DSM III-R antisocial personality disorder symptoms before vs. after the age of 15 years within a sample of 3226 male twins. The shared environment explained about six times more variance juvenile antisocial traits than in adult traits. The unique environment explained the largest proportion of variance in both juvenile and adult social traits. This study documented that characteristics of the shared or family environment that promote antisocial behavior during childhood and early adolescent also promotes later antisocial behavior, but to a much lesser extent. Genetic causal factors are much more prominent for adult than for juvenile antisocial behavior.

In 1996 Bohman and colleagues replicated their early Stockholm Adoption study which showed two types of adult...
alcoholism: adult onset dependence without criminality (type 1) and teenage onset of dependence with social and legal problems from alcohol abuse. The replication study used 577 men and 660 women adopted out in Gothenburg. They confirmed both Type 2 and severe Type 1 as independently inheritable forms of alcoholism in male adoptees.

**DATA SYNTHESIS**

The above citations have not been an attempt at systematic review and meta-analysis of all studies investigating the inheritability of alcoholism and criminality. Yet, major work in the field is discussed to create a framework relevant criminality in FASD.

Although the studies do not agree on all aspects (e.g., in 1978 Bohman does not find genetic association for criminality in his cohort whereas others do), there are three motifs, which resonate loud and clear:

a) There are several distinct traits of inheritable alcoholism.
b) There is a strong association between alcoholism and criminality.
c) There is strong inheritance of criminality.

Children with FASD, per definition, have an alcoholic mother and quite often also a problem drinker biological father. As such, these parents are much more likely than the general population to have antisocial and/or criminal behavior. Because these behaviors are inherited, their children, both those affected by FASD and those not affected, have a much higher risk for juvenile delinquency and criminality.

This analysis suggests that criminality among children with FASD is at least in part, the result of inheritance. This, of course, cannot rule out that ethanol or its metabolites cause organic brain damage that is also expressed in criminality, or alternatively, that other neurobehavioral disabilities in FASD lead or make the child vulnerable to criminality.

However, presently the effects of alcohol in causing offspring criminality must remain speculative and must await direct experimental evidence.

This conceptual direction agrees with a recent work by Lynch and colleagues, who studied 250 low income, predominantly black youth and their primary caregiver in the context of diagnosis of FAS. Three groups were drawn from a sample initially seen at birth: Alcohol exposed and dysmorphic, alcohol-exposed non-dysmorphic and non-exposed controls. The exposure groups did not differ from controls on measures of variety and frequency of delinquent behaviors; boys engaged in a wider range of delinquent acts than girls did. The authors concluded that “other current influences should be considered in addition to prenatal alcohol exposure in interpreting the development of delinquency in alcohol exposed adolescents.”

**PROPOSED FUTURE RESEARCH DIRECTIONS**

How can we then, separate the inheritability of criminality among alcoholics from the direct or indirect effects of ethanol on fetal brain? Several approaches might be considered:

1) Animal models of antisocial behavior and criminality, with/without exposure to alcohol.

2) Careful comparison of the types and characteristics of criminal activity among FASD victims as compared to those of known inheritable types of crimes.

3) Careful analysis of potential differences in criminal activities between genders, and contrasting it with genetic factors on gender-related criminality in non-FAS victims.

**REFERENCES**


3. Bohman M. Some genetic aspects of alcoholism and criminality. A population of
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