

# Verbal Intelligence and Criminal Offending Among Men With Schizophrenia

Åsa Eriksson, Sheilagh Hodgins, and Anders Tengström

---

*There are well-documented associations between low verbal IQ and criminal offending and between low verbal IQ and early-onset persistent offending among males in the general population. This study was designed to test whether similar associations could be observed in a sample of 219 men with schizophrenia and schizoaffective disorder. The participants were recruited at discharge from forensic and general psychiatric hospitals in four sites in Canada, Finland, Germany and Sweden. In the weeks preceding discharge, information was collected from participants, family members, staff, and official records. The results demonstrated that low verbal IQ was not associated with the risk of criminal offending, nor with the numbers of offences, but with the age at first non-violent offence. Low verbal IQ was associated with lengthy stays in hospital that may have limited further criminal offending.*

---

Epidemiological studies have consistently found that persons with schizophrenia are at increased risk for non-violent and violent offending (Arsenault, Moffit, Caspi, Taylor, & Silva, 2000; Brennan, Mednick, & Hodgins, 2000; Mullen, Burgess, Wallace, Palmer, & Ruschena, 2000). A growing body of evidence suggests that factors predicting offending in the general population also predict offending among people with schizophrenia (Bonta, Law, & Hanson, 1998; Steadman et al., 1998). Examining these factors among persons with schizophrenia may further understanding of offending in this population.

## **Low Verbal IQ is a Precursor of Criminal Offending Among Non-mentally Ill Individuals**

It has long been established that there is an association between low intelligence and criminal offending among non-mentally ill individuals (Farrington, 2000; Kratzer & Hodgins, 1999; Lynam, Moffit, & Stouthamer-Loeber, 1993; Moffit, Gabrielli, Mednick, & Schulsinger, 1981). Verbal abilities and verbal intelligence may be of special interest. Results from longitudinal studies have consistently demonstrated associations between low verbal IQ and delinquency (Lynam et al., 1993), and

---

“The Comparative study of the Prevention of Crime and Violence by Mentally Ill Persons” is being conducted by S. Hodgins, Institute of Psychiatry, King’s College London and Canada: Derek Eaves, Vancouver; Stephen Hart, Simon Fraser University; Christopher Webster, Simon Fraser University and McMaster University; Deborah Ross, Riverview Hospital, Coquitlam, British Columbia.

Finland: Jari Tiihonen, Markku Eronen, Vanha Vaasa Hospital, Vaasa and Niuvanniemi Hospital, Kuopio; Aija Räsänen, Eila Repo-Tiihonen, Kirsi Väänänen, Niuvanniemi Hospital, Kuopio; Päivi Toivonen, Aila Vokkolainen, Vanha Vaasa Hospital, Vaasa; Irma Kotilainen, National Authority for Medicolegal Affairs, Helsinki; Heikki Vartiainen, Helsinki Central University Hospital, Helsinki. Germany: Roland Freese, Dieter Jöckel, Rüdiger Müller-Isberner, Klinik für forensische Psychiatrie Haina, Haina (Kloster). Sweden: Robert Kronstrand, Rättsmedicinalverket and Linköping University, Linköping; Sten Levander, Eva Tuninger, Universitetssjukhuset, Lund.

Grants to support the study have been awarded by the BIO-MED-II programme of the European Union; Canada: the Forensic Psychiatric Services Commission of British Columbia, the Mental Health, Law and Policy Institute, Simon Fraser University, Riverview Hospital; Finland: Niuvanniemi and Vanha Vaasa State Mental Hospitals; Germany: Deutsche Forschungsgemeinschaft, Institut für forensische Psychiatrie Haina; Sweden: Medicinska Forskningsrådet, Vårdalstiftelsen, National Board of Forensic Medicine, Forensic Science Centre, Linköping University, and Linköping University. The present study was supported by Rättsmedicinalverket, Professor Bror Gadelius’ minnesfond, and Vårdalstiftelsen, Sweden.

Åsa Eriksson, Sheilagh Hodgins, and Anders Tengström are all at the Department of Clinical Neuroscience, Section of Alcohol and Drug Dependence Research, Karolinska Institute, Stockholm (academic); Åsa Eriksson is also at the Department of Forensic Psychiatry at the National Board of Forensic Medicine in Stockholm (clinic), Sheilagh Hodgins is also at the Institute of Psychiatry, King’s College, University of London, London, United Kingdom.

Correspondence concerning this article should be addressed to Åsa Eriksson, Rättspsykiatriska avdelningen, Box 4044, S-141 44 Stockholm, Sweden (E-mail: asa.eriksson@rmv.se).

between low verbal IQ and early-onset delinquency (Gibson, Piquero, & Tibbetts, 2001; Moffit & Caspi, 2001). Low verbal IQ has also been found to be associated with repeated offending (Vermeiren, Schwab-Stone, Ruchkin, De Clippele, & Deboutte, 2002).

One way to understand the association between low verbal IQ and offending is to view verbal deficiencies as a precursor to frustration and failure in the socialization process, leading to negative attitudes, alternative reward seeking, and sensitivity to peer pressure (Farrington, 2000; Moffit et al., 1981). Another perspective is that children with low verbal intelligence have problems manipulating abstract concepts, which results in an incapacity to delay gratification and to understand the consequences of actions and other peoples' feelings (Farrington, 2000).

### Verbal IQ and Schizophrenia

Children with low intelligence are at higher risk for schizophrenia than are children with higher intelligence. This has been consistently shown in longitudinal studies of birth and population cohorts (Cannon et al., 2000; Cannon et al., 2002; David, Malmberg, Brandt, Allebeck, & Lewis, 1997; Davidson et al., 1999; Gunnel, Harrison, Rasmussen, Fouskakis, & Tynelius, 2002; Reichenberg et al., 2002), and among children at elevated risk for schizophrenia (Cosway et al., 2000; Ott et al., 1998). More specifically, poor receptive language skills (Cannon et al., 2002) and abnormal speech (Bearden et al., 2000) are childhood antecedents of schizophrenia. Children at genetic risk for schizophrenia display poorer verbal skills than other children (Davalos, Compagnon, Heinlein, & Ross, 2004). When examining standardized educational test performance, decreased language scores after grade 4 characterized individuals who later developed schizophrenia (Fuller et al., 2002). Taken together, these findings indicate that low verbal intelligence is a precursor of schizophrenia.

The results of many studies suggest that intellectual functions remain stable during adulthood among individuals with schizophrenia (Gold, Arndt, Nopoulos, O'Leary, & Andreasen, 1999; Heaton et al., 2001; Hoff et al., 1999; Nopoulos, Flashman, Flaum, Arndt, & Andreasen, 1994; Sheitman et al.,

2000; for a review, see Rund, 1998). There is consistent evidence that intellectual functions are predictors of outcome (Addington & Addington, 2000; Robinson, Woerner, McMeniman, Mendelowitz, & Bilder, 2004; for reviews, see Elvevåg & Goldberg, 2000; Green, 1996). It is now recognized that it is important to assess intellectual functions in individuals with schizophrenia and to take intellectual deficits into consideration when setting up individual treatment plans. Specific programs for cognitive rehabilitation have been designed and evaluated (Hassiotis et al., 2001; Hogarty et al., 2004; Velligan et al., 2000; for a review, see Bellack, Gold, & Buchanan, 1999).

### IQ and Offending in Schizophrenia

Despite extensive research on the associations between IQ and criminal offending on one hand and IQ and schizophrenia on the other, surprisingly few studies have so far examined the association between IQ and criminality among individuals with schizophrenia. The studies that have been published differ as to methodology and focus, and none has investigated age at first crime.

One study (Krakowski et al., 1996) compared 102 in-patients with schizophrenia with and without a history of violent offending. A second study (Lafayette, Frankle, Pollock, Dyer, & Goff, 2003) compared 96 outpatients with schizophrenia divided into three groups: history of violent arrest, history of non-violent arrest, and no history of arrest. A third study (Barkataki et al., 2005) investigated 58 inpatients with schizophrenia, divided into three groups: patients with a history of violence with and without Antisocial Personality Disorder, and patients with no history of violence. In none of the studies were any significant differences found between the groups on measures of verbal and non-verbal IQ. Results from a two-year follow-up study of patients with schizophrenia revealed that low IQ did not predict violence (Walsh et al., 2004). By contrast, Puri, Richardson, Higgins, and Tresaden (2002) suggested that serious violent offenders with schizophrenia may have experienced a deterioration of intelligence after the onset of the disorder. However, the study was small ( $n = 17$ ) and included no comparison group.

### Previously Investigated Correlates of Offending Among Persons With Schizophrenia

Among individuals with schizophrenia, previously established correlates of offending include childhood behavior problems (Amminger et al., 1999; Arseneault et al., 2000; Bearden et al., 2000; Cannon et al., 2002; Fulwiler & Ruthazer, 1999; Hodgins & Janson, 2002; Hodgins, Lapalme, & Toupin, 1999; Hodgins, Tiihonen, & Ross, 2005; Kim-Cohen et al., 2003; Moran & Hodgins, 2004; Tengström, Hodgins, & Kullgren, 2001), and family adversity (Heads, Taylor, & Leese, 1997; Mueser et al., 1997; Tengström, Hodgins, & Kullgren, 2001). The associations between early behavior problems and offending and between family adversity and offending may result, at least in part, from low verbal IQ. Therefore, we examined the associations between low verbal IQ and offending, controlling for early behavior problems and family adversity.

### The Present Study

There are well-documented associations between low verbal IQ and criminal offending and between low verbal IQ and early-onset persistent offending among males in the general population. The current study was designed to investigate whether similar associations exist among men with schizophrenic disorders. We hypothesized that there would be associations between low verbal IQ and criminal offending, early onset of offending, and persistent offending. These associations were examined controlling for childhood behavior problems and family adversity.

## METHOD

### Participants

The sample consisted of 219 men with schizophrenia ( $n = 176$ ), schizoaffective disorder ( $n = 42$ ), or schizophreniform disorder ( $n = 1$ ). Participants were assessed prior to discharge from forensic psychiatric hospitals ( $n = 132$ ) and general psychiatric wards ( $n = 87$ ). The mean age of the participants was 37.7 years ( $SD = 11.4$ , range 18 - 75). The index hospitalization was longer for the participants from

the forensic hospitals ( $M = 4.0$  years, range 1 month - 23.1 years) than for the participants from the general psychiatric hospitals ( $M = 0.47$  years, range 2 weeks - 2.2 years). While all of the participants from the forensic hospitals had been convicted of a criminal offence (convicted or held not responsible, or partially not responsible, due to a mental disorder), this was true for only 32.2% of the participants from the general psychiatric hospitals.

### Instruments

*Structured Clinical Interview for DSM-IV (SCID; Spitzer, Williams, Gibbon, & First, 1990).* Diagnoses were made using the SCID I and II. The psychiatrists who conducted the interviews were trained and examined by the authors of the instrument. Diagnoses were made based on all available information from the participant, family members, staff, and records. Inter-rater reliabilities were measured by a second assessment on 15% of the participants. The kappa correlation for schizophrenia spectrum diagnosis versus other diagnoses was 1.0.

*Wechsler Adult Intelligence Scale (WAIS-R; Wechsler, 1981).* Intelligence was measured by the WAIS-R. The instrument comprises verbal and performance sub-scales. Low verbal IQ was defined as a score of 85 or less, one standard deviation below the mean.

*Criminality.* Information on criminality was extracted from official criminal records. Non-violent offending included offences such as stealing, car theft, and break and enter. Violent offending was defined as all offences causing physical harm, threat of violence or harassment, sexual offence, arson, robbery, forcible confinement, and illegal possession of firearms or explosives. Time at risk for offending was defined as the number of years after age 15 (or, after immigration, if that was the case) that a participant had not been hospitalized or incarcerated.

*Childhood behavior problems.* Information on childhood behavior problems was collected from interviews with the participant and family members, as well as from records. A problem was judged to have been present if it was reported from at least one source. Two measures of childhood behavior problems were created. The Childhood Behavior

Problem Index assessed behavior problems at home, in school, and in the community. Each problem was rated 1 if present with a total scale score ranging from 0 to 3. A second index of childhood behavior problems was the presence or absence of substance abuse before age 18.

*Family adversity.* Information on family adversity was also collected from multiple sources. Two measures of family adversity were created. The Parental Problem Index assessed mental disorders, substance abuse, and criminality among mothers and fathers. The presence of each problem was rated as 1, with the total scale score ranging from 0 to 6. A second index of adversity was the presence or absence of institutionalization before age 18.

## Procedure

Data were available from the Comparative study of the Prevention of Crime by Mentally Ill Persons, a follow-up study of forensic and general psychiatric patients, conducted in Canada, Finland, Germany, and Sweden. The project is described in detail elsewhere (Hodgins et al., in press). The participants were recruited into the project between 1998 and 2002. Every effort was made to invite all persons with a major mental disorder about to be discharged from the forensic hospitals within the catchment area to participate in the study.

The patients gave their written informed consent to participate, authorized access to medical and criminal records, and also named a family member to provide information about them. After consent was given, a structured diagnostic interview was completed. If a diagnosis of a major mental disorder was confirmed, the patient was included in the study. Persons discharged from general psychiatric hospitals were matched with the forensic sample on diagnosis, sex, and age. The procedure of inclusion in the study was the same for persons discharged from general psychiatric hospitals as for the persons discharged from forensic hospitals.

All diagnostic interviews and tests were conducted in the two weeks preceding discharge. If an intelligence test had been administered during the last year of inpatient treatment the results were considered valid and the scores were included. All available sources of information were used to provide

data: i.e., interviews with participants and relatives, official records and information from staff.

167 persons out of the 473 persons originally invited to participate in the study refused. The refusal rate was higher among persons discharged from general psychiatric hospitals (42.8%) than from forensic hospitals (29.4%),  $\chi^2(1, N = 473) = 9.099$ ,  $p = .001$ . For the present study, only male participants with schizophrenic disorders were included ( $n = 219$ ). No Swedish participants were included, since their intelligence had been examined with a shorter, non-comparable, Swedish test.

## Missing Data

There were some missing data in the assessments of verbal intelligence (missing = 39), Parental Problem Index (missing = 42), Child Behavior Problem Index (missing = 2), and institutionalization before age 18 (missing = 2). The other data were complete. Analyses revealed that a significantly larger proportion of the participants from the forensic hospitals (89%) had completed an intelligence test as compared to the participants from general psychiatric hospitals (70%),  $\chi^2(1, N = 218) = 17.001$ ,  $p = .001$ . There were no differences between the participants who had and who had not completed an intelligence test in age, number of years of education, proportion of immigrants, age at first conviction for a non-violent or violent crime, number of non-violent or violent crimes, or the presence or absence of substance abuse before age 18.

## Analyses

Methods for analysis were  $\chi^2$ -tests, Pearson  $r^2$  correlations,  $t$ -tests, and multiple regressions. All univariate and multivariate analyses were performed using SPSS REGRESSION and SPSS FREQUENCIES for evaluation of assumptions. With the use of standard residuals, outliers that were found to deviate more than three standard deviations from the mean were removed from the regression analyses. In case of skewed distributions, log transformations were used. Results were considered to be significant if  $p < .05$ . Two-tailed tests were applied. Kappa correlations were calculated to assess inter-rater reliability.

## RESULTS

The mean verbal IQ score for the sample was 92.18 ( $SD = 15.25$ ). This is significantly lower than the mean for the general population,  $t(169) = -6.687$ ,  $p = .001$ ,  $CI = -10.13 - -5.51$ . One-third of the participants (33.5%) had a verbal IQ score of 85 or below.

### Is Low Verbal IQ Associated With Non-violent and Violent Offending?

Participants with low verbal IQ ( $\leq 85$ ) were not more likely than participants with verbal IQ scores in the normal range ( $> 85$ ) to have been convicted of non-violent crimes (verbal IQ  $\leq 85$ , 52.6%, verbal IQ  $> 85$ , 51.3%, respectively),  $\chi^2(170) = .026$ ,  $p = .872$ , or violent crimes (verbal IQ  $\leq 85$ , 68.4%, verbal IQ  $> 85$ , 67.3%, respectively),  $\chi^2(170) = .023$ ,  $p = .878$ .

### Is Low Verbal IQ Associated With Age at First Conviction for Non-violent or Violent Crimes?

Pearson correlations were calculated to investigate the associations between verbal IQ and age at first non-violent and violent conviction. The analyses revealed an association between verbal IQ score and age at first conviction for a non-violent crime ( $r = .285$ ,  $p = .010$ ), but not between verbal IQ score and age at first conviction for a violent crime ( $r = .125$ ,  $p = .197$ ). An association was also found between verbal IQ and the age at first conviction for any crime ( $r = .221$ ,  $p = .013$ ).

Participants with low verbal IQ scores were younger at first conviction for a non-violent crime ( $M = 22.60$ ,  $SD = 9.28$ ) as compared to participants with verbal IQ scores in the normal range ( $M = 25.85$ ,  $SD = 10.13$ ),  $t(78) = 1.362$ ,  $p = .177$ . Participants with low verbal IQ were slightly younger at first conviction for a violent crime ( $M = 27.18$ ,  $SD = 10.34$ ) as compared to participants with verbal IQ scores in the normal range ( $M = 29.93$ ,  $SD = 10.29$ ),  $t(106) = 1.320$ ,  $p = .190$ . None of the differences were statistically significant.

### Is Low Verbal IQ Associated With Persistent Non-violent and Violent Offending?

To investigate the associations between verbal IQ and non-violent and violent offending, Pearson correlations were calculated between verbal IQ scores and the numbers of non-violent and violent crimes. Due to skewed distributions, log transformations were made of the number of non-violent crimes and the number of violent crimes. A weak negative association was found between verbal IQ score and the number of non-violent crimes ( $r = -.152$ ,  $p = .048$ ). No association was detected between verbal IQ and the number of violent crimes ( $r = .016$ ,  $p = .832$ ).

Participants with low verbal IQ had committed more non-violent crimes ( $M = 7.46$ ,  $SD = 13.92$ ) as compared to participants with verbal IQ within the normal range ( $M = 4.22$ ,  $SD = 9.71$ ),  $t(168) = -1.764$ ,  $p = .08$ , and more violent crimes ( $M = 3.21$ ,  $SD = 7.31$ ,  $M = 2.16$ ,  $SD = 3.04$ ),  $t(167) = -1.316$ ,  $p = .190$ . These differences were, however, not statistically significant.

In an effort to understand why verbal IQ was associated with age of first non-violent conviction but not the number of non-violent crimes, a series of post-hoc analyses were conducted. There was a significant negative correlation between verbal IQ and the total length of all hospitalizations ( $r = -.200$ ,  $p = .009$ ), but not between verbal IQ and the total length of all incarcerations ( $r = -.130$ ,  $p = .090$ ). Participants with low verbal IQ were found to have been hospitalized longer (101.02 months,  $SD = 111.02$ ) as compared to participants with verbal IQ scores in the normal range (55.60 months,  $SD = 54.81$ ),  $t(168) = -3.576$ ,  $p = .000$ . The participants with low verbal IQ were incarcerated on average 9.16 months, ( $SD = 21.89$ ) and participants with verbal IQ scores in the normal range 5.27 months ( $SD = 16.19$ ), but the difference was not statistically significant,  $t(168) = -1.307$ ,  $p = .193$ .

In an effort to assess the importance of the association that had been detected between low verbal IQ and non-violent offending, a standard multiple regression analysis was calculated to predict the number of non-violent crimes. In order to normalize the distribution, a log transformation was

made of the number of non-violent crimes. Six predictors were entered into the model: verbal IQ, score on the Childhood Behavior Problem Index, the presence or absence of substance abuse before age 18, Parental Problem Index, the presence or absence of institutionalization before age 18, and time at risk for offending. The latter variable was entered to control for the possible impact on persistent criminality. The  $R^2$  value for the model was .199. Two predictors were associated with the number of non-violent crimes: institutionalization before age 18 ( $\beta = .257, p = .003$ ) and substance abuse before age 18 ( $\beta = .186, p = .032$ ). Verbal IQ did not contribute to the model.

### Is Low Verbal IQ Associated With Childhood Problems and/or Family Adversity?

Further analyses were conducted in an effort to understand whether the link between low verbal IQ and early-onset criminal offending could be explained by associations between verbal IQ and childhood factors that are known to increase the risk of offending. There was no association between verbal IQ scores and the scores on the Childhood Behavior Problem Index ( $r = -.116, p = .134$ ), nor

between verbal IQ and the Parental Problem Index ( $r = -.088, p = .301$ ). Participants with low verbal IQ were not more likely than those with verbal IQ scores in the normal range to have begun abusing before age 18 (VIQ  $\leq 85 = 42.1\%$ ; VIQ  $> 85 = 54.0\%$ , respectively),  $\chi^2(170) = 2.138, p = .144$ . One-third (35.1%) of the participants with verbal IQ  $\leq 85$  had been institutionalized before age 18 as compared to less than one quarter (22.3%) of the participants with verbal IQ  $> 85$ ,  $\chi^2(169) = 3.151, p = .076$ . To summarize, verbal IQ was not found to be significantly associated with any of the four childhood factors that have previously been shown to increase the risk of offending.

A standard multiple regression analysis was calculated to predict age at first conviction for a non-violent crime, controlling for childhood problems and family adversity. The results are presented in Table 1. Five predictors were entered into the analysis: verbal IQ, Childhood Behavior Problem Index, the presence or absence of a substance abuse before age 18, Parental Problem Index, and the presence or absence of institutionalization before age 18. Verbal IQ and substance abuse before age 18 were two significant, independent predictors of age at first non-violent conviction.

Table 1  
*Standard Regression Analysis Predicting Age at First Conviction for a Non-Violent Crime*

Independent variable	Age at first conviction for a non-violent crime (n = 60)			
	B	SE B	$\beta$	p
Verbal IQ	.247	.073	.377	.001
Childhood behavior problem index	-.938	.890	-.128	.296
Substance abuse before age 18	-5.464	2.036	-.324	.010
Parental problem index	-.446	1.023	-.050	.665
Institution before age 18	-3.234	2.088	-.177	.127

Test of model  $F(5, 54) = 6.995, p = .000, R^2 = .427$   
2 outliers were removed

## DISCUSSION

The objective of this study was to investigate whether an association would be observed between low verbal IQ and criminal offending and between low verbal IQ and early-onset persistent offending among males with schizophrenic disorders. Unlike what has been observed in the general population, among men with schizophrenic disorders, low verbal IQ did not increase the risk of criminal offending. Low verbal IQ was not associated with the number of violent offences. Low verbal IQ was weakly associated with the number of non-violent offences, but the association disappeared once substance abuse and institutionalization before age 18 were entered into the model. Low verbal IQ was found to be associated with a younger age at first non-violent offence.

Our finding that low verbal IQ was associated with an early onset of criminal offending within this group of participants with schizophrenia and schizoaffective disorder may have implications for prevention and early intervention. It is important that teachers and child clinicians identify children with intellectual problems and behavioral disturbances as early as possible and refer them to appropriate programs. Evidence suggests that such programs should focus on social and cognitive skills training to help children to develop alternative behaviors (Gibson et al., 2001) and prevention of early substance abuse (Abram, Teplin, McClelland, & Dulcan, 2003; Clark, Kirisci, & Tarter, 1998). Extra attention should be given to children of parents with schizophrenia who are at higher risk to develop mental illness in general and schizophrenia in particular than are children of healthy parents (Erlenmeyer-Kimling et al., 1997; Niemi, Suvisaari, Haukka, Wrede, & Lonnqvist, 2004; Schubert & McNeil, 2003).

No clear association was observed between low verbal IQ and persistent criminality. Post-hoc analyses revealed a negative and significant correlation between verbal IQ and the length of hospitalizations, suggesting that the participants with low verbal IQ were more often provided with full-time care than participants with normal levels of intellectual functioning. Clinicians may judge that patients with schizophrenia and a low verbal IQ are at risk to recidivate and therefore they may be

reluctant to discharge them. There may also be fewer appropriate after-care services for offenders with low verbal IQ and schizophrenia. However, in a multiple regression analysis, time at risk for offending did not predict the number of offences. To understand the lack of association between low verbal IQ and persistent criminality, it cannot be ruled out that individuals with low verbal IQ were more closely supervised after discharge than individuals with verbal IQ in the normal range and thus committed fewer offences.

While low verbal IQ was not found to be a predictor of the number of non-violent crimes, substance abuse before age 18 and institutionalization before age 18 both made significant, independent contributions to the prediction of the number of non-violent crimes. The finding demonstrates the association of adverse childhood factors with persistent offending and emphasizes the necessity of taking early signs of behavioral problems and/or family adversity into consideration when assessing the risk of recidivism into criminality among individuals with schizophrenia (Hodgins et al., 2005).

No significant associations were detected between verbal IQ and violent offending. This could be due in part to the fact that only patients discharged from hospitals were included in the sample. Since the participants with low verbal IQ had been hospitalized twice as long as other participants, it is reasonable to assume that individuals with low verbal IQ were underrepresented in the sample. Among those patients not discharged, there may have been patients with low verbal IQ and histories of severe early-onset violence assessed to be at higher risk for violent recidivism and therefore not discharged.

Another reason that the hypothesis of an association between low verbal IQ and violent criminality was not confirmed may simply be that violent criminality, on the whole, is more difficult to predict than non-violent offending. While most non-violent offenders display early-onset, persistent offending, easy for researchers to characterize and for clinicians to predict, many patients who commit violent offences commit only one such offence. In the present study, 32% of the participants ever convicted for a violent offence had committed only one violent offence. In a study of a German cohort of homicide offenders with schizophrenia (Erb et al.,

2001) one sub-group was identified who had a long history of illness and no criminal convictions before the homicide. While meta-analyses have shown that criminal history is the best predictor of violent offending in persons with a mental disorder (i.e., Bonta et al., 1998), criminal history identifies the persistent offender who usually commits both non-violent and violent crimes. The challenge is now to understand why persons with schizophrenia and no history of antisocial behavior commit violent offences.

The proportion of participants with low verbal IQ was high (33.5%). As observed among non-criminal individuals with schizophrenia, individuals with intellectual deficits constitute a special challenge for treatment and after care-services. They may need specific programs of cognitive rehabilitation and/or case management (Bellack et al., 1999). For individuals with schizophrenia, intellectual deficits, and an antisocial lifestyle, such programs should also teach pro-social attitudes and ways to reduce substance abuse.

One strength of this study is that diagnoses and assessment of IQ were made by experienced clinicians, trained to use standardized and validated procedures. Another strength is that data were acquired from multiple sources including the participant, family members and staff, and from medical, social service and criminal records. The major limitation of this study is its retrospective design. However, information from multiple sources may have reduced the risk of biased information due to recall problems or information based on social desirability. Another limitation of the study is the high refusal rate among the patients who were invited to participate (35.3 %) although no significant differences were observed between participants and those who refused on relevant variables. In addition, there were no significant differences between participants who did and who did not complete an IQ test. Thus, it is unlikely that the refusals and missing data affected the results. As previously noted, only patients who were discharged were included in the study, and this may have led to an under representation of patients with low verbal IQ in the sample.

To conclude, among men with schizophrenic disorders, low verbal IQ did not increase the risk of criminal offending, but among those who did offend

it was associated with a younger age at first conviction for a non-violent crime. Low verbal IQ was also found to be associated with longer stays in hospital that may have limited subsequent offending.

## REFERENCES

- Abram, K. M., Teplin, L. A., McClelland, G. M., & Dulcan, M. K. (2003). Comorbid psychiatric disorders in youth in juvenile detention. *Archives of General Psychiatry, 60*, 1097-1108.
- Addington, J. & Addington, D. (2000). Neurocognitive and social functioning in schizophrenia: a 2.5 year follow-up study. *Schizophrenia Research, 44*, 47-56.
- Amminger, G. P., Pape, S., Rock, D., Roberts, S. A., Looser Ott, S., Squires-Wheeler, S., et al. (1999). Relationship between childhood behavioral disturbance and later schizophrenia in the New York High-Risk Project. *American Journal of Psychiatry, 156*, 525-530.
- Arseneault, L., Moffitt, T. E., Caspi, A., Taylor, P. J., & Silva, P. A. (2000). Mental disorders and violence in a total birth cohort: results from the Dunedin Study. *Archives of General Psychiatry, 57*, 979-986.
- Barkataki, I., Kumari, V., Das, M., Hill, M., Morris, R., O'Connell, P., Taylor, P., & Sharma, T. (2005). A neuropsychological investigation into violence and mental illness. *Schizophrenia Research, 74*, 1-13.
- Bearden, C. E., Rosso, I. M., Hollister, J. M., Sanchez, L. E., Hadley, T., & Cannon, T. D. (2000). A prospective cohort study of childhood behavioral deviance and language abnormalities as predictors of adult schizophrenia. *Schizophrenia Bulletin, 26*, 395-410.
- Bellack, A. S., Gold, J. M., & Buchanan, R. W. (1999). Cognitive rehabilitation for schizophrenia: Problems, prospects, and strategies. *Schizophrenia Research, 25*, 257-274.
- Bonta, J., Law, M., & Hanson, K. (1998). The prediction of criminal and violent recidivism among mentally disordered offenders: A meta-analysis. *Psychological Bulletin, 123*, 123-142.
- Brennan, P. A., Mednick, S. A., & Hodgins, S. (2000). Major mental disorders and criminal violence in a Danish birth cohort. *Archives of General Psychiatry, 57*, 494-500.
- Cannon, M., Caspi, A., Moffitt, T. E., Harrington, H., Taylor, A., Murray, R. M. et al. (2002). Evidence for early-childhood, pan-developmental impairment specific to schizophreniform disorder. *Archives of General Psychiatry, 59*, 449-456.
- Cannon, T. D., Bearden, C. E., Hollister, J. M., Rosso, I. M., Sanchez, L. E., & Hadley, T. (2000). Childhood cognitive functioning in schizophrenia patients and their unaffected siblings: A prospective cohort study. *Schizophrenia Bulletin, 26*, 379-393.
- Clark, D. B., Kirisci, L., & Tarter, R. E. (1998). Adolescent versus adult onset and the development of substance use disorders in males. *Drug and Alcohol Dependence, 49*, 115-121.
- Cosway, R., Byrne, M., Clafferty, R., Hodges, A., Grant, E., Abukmeil, S. S., et al. (2000). Neuropsychological change

- in young people at high risk for schizophrenia: results from the first two neuropsychological assessments of the Edinburgh High Risk Study. *Psychological Medicine*, 30, 1111-1121.
- Davalos, D. B., Compagnon, N., Heinlein, S., & Ross, R. G. (2004). Neuropsychological deficits in children associated with increased familial risk for schizophrenia. *Schizophrenia Research*, 67, 123-130.
- David, A. S., Malmberg, A., Brandt, L., Allebeck, P., & Lewis, G. (1997). IQ and risk for schizophrenia: a population-based cohort study. *Psychological Medicine*, 27, 1311-1323.
- Davidson, M., Reichenberg, A., Rabinowitz, J., Weiser, M., Kaplan, Z., & Mark, M. (1999). Behavioral and intellectual markers for schizophrenia in apparently healthy male adolescents. *American Journal of Psychiatry*, 156, 1328 – 1335.
- Elvevåg, B., Goldberg, T. E. (2000). Cognitive impairment in schizophrenia is the core of the disorder. *Critical Reviews in Neurobiology*, 14, 1-21.
- Erb, M., Hodgins, S., Freese, R., Müller-Isberner, R., & Jöckel, D. (2001). Homicide by persons suffering from schizophrenia: Maybe treatment does have a preventive effect. *Criminal Behaviour and Mental Health*, 11, 6–26.
- Erlenmeyer-Kimling, L., Adamo, U. H., Rock, D., Roberts, S. A., Bassett, A. S., Squires-Wheeler, E., et al. (1997). The New York High-Risk Project. Prevalence and comorbidity of axis I disorders in offspring of schizophrenic parents at 25-year follow-up. *Archives of General Psychiatry*, 54, 1096-1102.
- Farrington, D. P. (2000). Psychosocial predictors of adult antisocial personality and adult convictions. *Behavioral Sciences and the Law*, 18, 605-622.
- Fuller, R., Nopoulos, P., Arndt, S., O'Leary, D., Ho, B.-C., & Andreasen, N. C. (2002). Longitudinal assessment of premorbid cognitive functioning in patients with schizophrenia through examination of standardized scholastic test performance. *American Journal of Psychiatry*, 159, 1183 – 1189.
- Fulwiler, C., & Ruthazer, R. (1999). Premorbid risk factors for violence in adult mental illness. *Comprehensive Psychiatry*, 40, 96-100.
- Gibson, C. L., Piquero, A. R., & Tibbetts, S. G. (2001). The contribution of family adversity and verbal IQ to criminal behavior. *International Journal of Offender Therapy & Comparative Criminology*, 45, 574-592.
- Gold, S., Arndt, S., Nopoulos, P., O'Leary, D. S., Andreasen, N. C. (1999). Longitudinal study of cognitive function in first-episode and recent-onset schizophrenia. *American Journal of Psychiatry*, 156, 1342 – 1348.
- Green, M. F. (1996). What are the functional consequences of neurocognitive deficits in schizophrenia? *American Journal of Psychiatry*, 153, 321-330.
- Gunnel, D., Harrison, G., Rasmussen, K., Fouskakis, D., & Tynelius, P. (2002). Associations between premorbid intellectual performance, early-life exposures and early-onset schizophrenia. *British Journal of Psychiatry*, 181, 298-305.
- Hassiotis, A., Ukoumunne, O. C., Byford, S., Tyrer, P., Harvey, K., Piachaud, J. et al. (2001). Intellectual functioning and outcome of patients with severe psychotic illness randomized to intensive case management. *British Journal of Psychiatry*, 178, 166-171.
- Heads, T. C., Taylor, P. J., Leese, M. (1997). Childhood experiences of patients with schizophrenia and a history of violence: A special hospital sample. *Criminal Behaviour & Mental Health*, 7, 117-130.
- Heaton, R. K., Gladsjo, J. A., Palmer, P.W., Kuck, J., Marcotte, & Jeste, D. V. (2001). Stability and course of neuropsychological deficits in schizophrenia. *Archives of General Psychiatry*, 58, 24-32.
- Hodgins, S., & Janson, C-G. (2002). *Criminality and violence among the mentally disordered: The Stockholm Metropolitan Project*. Cambridge: Cambridge University Press.
- Hodgins, S., Lalpalme, M., & Toupin, J. (1999). Criminal activities and substance use of participants with major affective disorders and schizophrenia: a 2-year follow-up. *Journal of Affective Disorders*, 55, 187-202.
- Hodgins, S., Tengström A., Östermann R., Eaves D., Hart S., Kronstrand R. et al. (in press). An international comparison of community treatment programs for mentally ill persons who have committed criminal offences: A preliminary report. *Criminal Justice and Behavior*.
- Hodgins, S., Tiihonen, J., & Ross, D. (2005). The consequences of conduct disorder for males who develop schizophrenia: Associations with criminality, aggressive behavior, substance use, and psychiatric services. *Schizophrenia Research*, 78, 323-335.
- Hoff, A. L., Sakuma, M., Wieneke, M., Horon, R., Kushner, M., & DeLisi, L. E. (1999). Longitudinal neuropsychological follow-up of patients with first-episode schizophrenia. *American Journal of Psychiatry*, 156, 1336-1341.
- Hogarty, G. E., Flesher, S., Ulrich, R., Carter, M., Greenwald, D., Pogue-Geile, M. et al. (2004). Cognitive enhancement therapy for schizophrenia: Effects of a 2-year randomized trial on cognition and behavior. *Archives of General Psychiatry*, 61, 866-876.
- Kim-Cohen, J., Caspi, A., Moffitt, T. E., Harrington, H. L., Milne, B. J., & Poulton, R. (2003). Prior juvenile diagnoses in adults with mental disorder. *Archives of General Psychiatry*, 60, 709-717.
- Krakowski, M., Czobor, P., Carpenter, M. D., Nolan, K., Libiger, J., Kuntz, M. et al. (1996). Violent crime in psychiatric patients: Relationship to frontal lobe impairment. *American Journal of Forensic Psychiatry*, 17, 53-59.
- Kratzer, L. & Hodgins, S. (1999). A typology of offenders: A test of Moffitt's theory among males and females from childhood to age 30. *Criminal Behavior & Mental Health*, 9, 57-73.
- Lafayette, J. M., Frankle, W. G., Pollock, A., Dyer, K., & Goff, D. C. (2003). Clinical characteristics, cognitive functioning, and criminal histories of outpatients with schizophrenia. *Psychiatric Services*, 54, 1635-1640.
- Lynam, D., Moffitt, T. E., & Stouthamer-Loeber, M. (1993). Explaining the relation between IQ and delinquency: Class, race, test motivation, school failure, or self-control? *Journal of Abnormal Psychology*, 102, 187-196.
- Moffitt, T. E., & Caspi, A. (2001). Childhood predictors differentiate life-course persistent and adolescence-limited antisocial pathways among males and females. *Development and Psychopathology*, 13, 355-375.

- Moffitt, T. E., Gabrielli, W. F., Mednick, S. A., & Schulsinger, F. (1981). Socioeconomic status, IQ, and delinquency. *Journal of Abnormal Psychology, 90*, 152-156.
- Moran, P., & Hodgins, S. (2004). The correlates of co-morbid antisocial personality disorder in schizophrenia. *Schizophrenia Bulletin, 30*, 791-802.
- Mueser, K. T., Drake, R. E., Ackerson, T., Alterman, A. I., Miles, K. M., & Noordsy, D. L. (1997). Antisocial personality disorder, conduct disorder and substance abuse in schizophrenia. *Journal of Abnormal Psychology, 106*, 473-477.
- Mullen, P. E., Burgess, P., Wallace, C., Palmer, S., & Ruschena, D. (2000). Community care and criminal offending in schizophrenia. *The Lancet, 355*, 614-617.
- Niemi, L. T., Suvisaari, J. M., Haukka, J. K., Wrede, G., Lonnqvist, J. K. (2004). Cumulative incidence of mental disorders among offspring of mothers with psychotic disorder. Results from the Helsinki High-Risk Study. *British Journal of Psychiatry, 185*, 11-17.
- Nopoulos, P., Flashman, L., Flaum, M., Arndt, S., & Andreasen, N. (1994). Stability of cognitive functioning early in the course of schizophrenia. *Schizophrenia Research, 14*, 29-37.
- Ott, S.L., Spinelli, S., Rock, D., Roberts, S., Amminger, G.P., Erlenmeyer-Kimling, L. (1998). The New York High-Risk Project: social and general intelligence in children at risk for schizophrenia. *Schizophrenia Research, 31*, 1-11.
- Puri, B. K., Richardson, A. J., Higgins, C. J., & Tresaden, I. H. (2002). Reduction in IQ in patients with schizophrenia who have seriously and dangerously violently offended. *Schizophrenia Research, 53*, 267-268.
- Reichenberg, A., Weiser, M., Rabinowitz, J., Caspi, A., Schmeidler, J., Mordechai, M., et al. (2002). A population-based cohort study of premorbid intellectual, language, and behavioral functioning in patients with schizophrenia, schizoaffective disorder, and nonpsychotic bipolar disorder. *American Journal of Psychiatry, 159*, 2027-2035.
- Robinson, D. G., Woerner, M. G., McMeniman, M., Mendelowitz, A., & Bilder, R. M. (2004). Symptomatic and functional recovery from a first episode of schizophrenia or schizoaffective disorder. *American Journal of Psychiatry, 161*, 473-479.
- Rund, B. R. (1998). A review of longitudinal studies of cognitive functions in schizophrenia. *Schizophrenia Bulletin, 24*, 425-435.
- Schubert, E. W. & McNeil, T. F. (2003). Prospective study of adult mental disturbance in offspring of women with psychosis. *Archives of General Psychiatry, 60*, 473-480.
- Sheitman, B. B., Murray, M. G., Snyder, J. A., Silva, S., Goldman, R., Chakos, M. et al. (2000). IQ scores of treatment-resistant schizophrenia participants before and after the onset of the illness. *Schizophrenia Research, 46*, 203-207.
- Spitzer, R. L., Williams, J. B. W., Gibbon, M., & First, M. B. (1990). *Structured clinical interview for DSM-III-R*. Washington, DC: American Psychiatric Press.
- Steadman, H. J., Mulvey, E. P., Monahan, J., Robbins, P. C., Appelbaum, P. S., Grisso, T., et al. (1998). Violence by people discharged from acute psychiatric inpatient facilities and by others in the same neighborhoods. *Archives of General Psychiatry, 55*, 393-401.
- Tengström, A., Hodgins, S., & Kullgren, G. (2001). Men with schizophrenia who behave violently: the usefulness of an early versus late-start offender typology. *Schizophrenia Bulletin, 27*, 205-218.
- Velligan, D. I., Bow-Thomas, C. C., Huntzinger, C., Ritch, J., Ledbetter, N., Prihoda, T. J., et al. (2000). Randomized controlled trial of the use of compensatory strategies to enhance adaptive functioning in outpatients with schizophrenia. *American Journal of Psychiatry, 157*, 1317-1323.
- Vermeiren, R., Schwab-Stone, M., Ruchkin, V., De Clippele, A., & Deboutte, D. (2002). Predicting recidivism in delinquent adolescents from psychological and psychiatric assessment. *Comprehensive Psychiatry, 43*, 142-149.
- Walsh, E., Gilvarry, C., Samele, C., Harvey, K., Manley, C., Tattan, T., et al. (2004). Predicting violence in schizophrenia: a prospective study. *Schizophrenia Research, 67*, 247-252.
- Wechsler, D. (1981). *WAIS-R Manual*. New York: The Psychological Corporation.