

**TECHNICAL NOTE**  
**PSYCHIATRY**

Manuel Lopez-Leon,<sup>1,2</sup> M.D. and Richard Rosner,<sup>1,2</sup> M.D.

## Intellectual Quotient of Juveniles Evaluated in a Forensic Psychiatry Clinic After Committing a Violent Crime\*

**ABSTRACT:** The purpose of this preliminary study is to evaluate if there is a difference between the intelligence quotient (IQ) of 27 adolescent defendants referred to the Bellevue Hospital Center Forensic Psychiatry Clinic after committing violent crimes, and those adolescents in the same age group in the general population of the United States, as defined by the norms of the psychometric testing instrument Wechsler Intelligence Scale for Children, 4th edition (WISC-IV). The IQ scores and sub-scores were compared to IQ scores of the general population (mean = 100, SD = 15) using a Z-test. The mean for the Full Scale IQ was 82.93. The means for the subtests which include Processing Speed Index, Perceptual Reasoning Index, Verbal Comprehension Index, and Working Memory Index, were: 78.48, 87.78, 86.70 ( $p < 0.05$ ), and 90.78 ( $p = 0.09$ ) respectively. There is a statistically significant difference in the IQ scores of the violent juveniles studied when compared to the general population.

**KEYWORDS:** forensic sciences, forensic psychiatry, intelligence, Wechsler Scales, violence, adolescent

Over the past several decades there has been an increasing interest in understanding adolescent violence. Even though there have been several factors attributed as contributing to teenage violence, including head trauma, educational difficulties, cognitive problems, physical child abuse, epilepsy, limbic and reticular activating system disorders, and developmental disorders (1–4), empirical knowledge on this subject is scarce. Economic, biological, social, environmental, and cultural influences have also been motif of behavioral science research attempting to explain criminality (5).

Early studies investigating the family backgrounds of juveniles who were arrested or convicted of delinquent acts consistently found an association between juvenile delinquency and parental arrests. These studies suggested that a familial link for criminal behavior is independent of the family's socioeconomic status and parent and child intelligence (6). Research by Sheldon and Eleanor Glueck and several corroborating studies with different samples have demonstrated that certain personal traits are criminogenic and that differences in body build, personality, and intelligence make the people most at risk of criminal behavior (7). It has been found that mental test scores in adolescence are better predictors of adult functioning than those obtained in earlier ages (8). However, intelligence quotient (IQ) is a factor that has not been evaluated fully in regards to delinquent violence. One study evaluated the characteristics of adolescents who kill using psychometric tests and concluded that homicidal teenagers differed in that they had more educational

difficulties, including retardation, and lower perceptual and full IQ scores, when compared to nonviolent juvenile delinquents (9). Another study reported that intellectual ability deficiencies and cerebral lesions were implicated in adults who perpetrate violent crimes (1).

It is important to study whether there is an intellectual deficit in juveniles in New York State, between the ages of 13 and 15 who have been charged with particularly violent felony offenses because this may impact their legal disposition. In New York County, these individuals are indicted and referred to the Supreme Court's special Youth Part. Since 2003, the Forensic Psychiatry Clinic has maintained a policy of conducting psychometric testing evaluating the IQ to all defendants under the age of 17. This information assists the Courts in their decision-making process and can affect the severity of the sentence imposed.

The purpose of this preliminary study is to evaluate if adolescents who commit violent crimes have lower scores in psychometric testing. The null hypothesis is that there is no difference between the IQ of adolescent defendants who were at liberty in the community when referred to the Bellevue Hospital Center Forensic Psychiatry Clinic after committing violent crimes, and those adolescents in the same age group in the general population of the United States.

### Methods

A retrospective chart review was used in order to include all the juvenile defendants referred by the New York County Supreme Court to the Bellevue Hospital Center Forensic Psychiatry Clinic between 2003 and 2005, who perpetrated violent crimes, were between 14 and 16 years of age, and who were administered the WISC-IV. In order to maximize similarities with the general population of the United States, the adolescents whose cases were reviewed for this study were at liberty in the community at the time they committed the offense. According to the standard

<sup>1</sup>New York University School of Medicine—Forensic Psychiatry, New York, NY.

<sup>2</sup>Bellevue Hospital Forensic Psychiatry Clinic—Psychiatry, New York, NY.

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protocol of the Forensic Psychiatry Clinic, psychometric testing was conducted with these adolescents using the Wechsler Intelligence Scale for Children, 4th edition (WISC-IV) as part of their forensic evaluation. The data obtained was compared to the WISC-IV norms standardized to the general population of teenagers in the U.S.A. according to the WISC-IV Technical and Interpretational Manual (mean = 100, SD = 15) (10).

The WISC-IV allows the breakdown of the Full Scale Intellectual Quotient (FSIQ) into subtests of different areas of cognitive abilities. There are four index scores, which compose the FSIQ: the Verbal Comprehension Index (VCI), the Perceptual Reasoning Index (PRI), the Working Memory Index (WMI), and the Processing Speed Index (PSI). The VCI is composed of subtests measuring verbal abilities utilizing reasoning, comprehension, and conceptualization. The PRI is composed of subtests measuring perceptual reasoning and organization evaluating the subject's abilities in understanding similarities, and evaluating vocabulary, comprehension, information, and word reasoning. Tasks used to evaluate the PRI include block design, picture concepts, matrix reasoning, and picture completion. The WMI is composed of subtests measuring attention, concentration, and working memory. It is evaluated through digit span, letter-number sequencing, and arithmetic. Finally, the PSI is composed of subtests measuring the speed of mental and graphomotor processing, and is tested through coding, symbol search, and cancellation (10).

To ensure that the population studied had a normal distribution a Kolmogorov-Smirnov Z-Test was performed with the help of the SPSS (Statistical Package for the Social Sciences, version 10.0, SPSS, Inc., Chicago, IL) software. We used a standard Z-Test to compare the means and standard deviations of the FSIQ as well as the four subscales (PSI, WMI, VPI, and PRI) of the studied population with those of the WISC-IV standards for the general population. This study was approved by the Institutional Board of Research Associates (IBRA) of the New York University School of Medicine, and by the IBRA of Bellevue Hospital Center.

## Results and Discussion

Twenty-seven males who committed violent crimes were included in the study. They were referred by the New York County Supreme Court to the Bellevue Hospital Center Forensic Psychiatry Clinic between 2003 and 2005 for pre-sentencing evaluation, and were evaluated using the WISC-IV. The average age of the sample was 14.92 years. Out of the 27 subjects, 17 were African Americans, nine were Hispanics and one was Caucasian. Seven had no reported history of substance abuse. Five defendants were diagnosed with Depressive Disorder Not Otherwise Specified (NOS), five with Disruptive Behavior Disorder, three with Conduct Disorder, two with Attention Deficit/Hyperactivity Disorder (ADHD), two with Learning Disabilities, one with Generalized Anxiety Disorder, one with Bipolar Disorder, and the rest had no psychiatric diagnosis. The majority of the violent teenagers studied were not diagnosed with Conduct Disorder, a historical requisite for an adult diagnosis of Antisocial Personality Disorder.

All five variables had a normal distribution: FSIQ ( $p = 0.64$ ), VCI ( $p = 0.49$ ), PRI ( $p = 0.70$ ), WMI ( $p = 0.82$ ), and PSI ( $p = 0.67$ ). The mean and the standard deviations (SD) were VCI 86.70 (18.30), PRI 87.78 (12.61), WMI 90.78 (13.69) PSI 78.48 (11.56), and FSIQ 82.93 (14.81). The defendants evaluated after committing a violent crime had significant intellectual deficits when compared to the average American population within the same age group. In Fig. 1 the mean and SD of the scores of the population studied are compared to those of the rest of the population in the

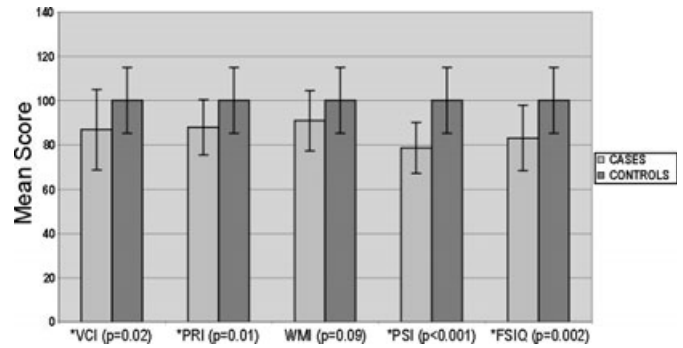


FIG. 1—Controls = WISC-IV norms standardized to the general population of teenagers in the U.S.A. according to the WISC-IV Technical and Interpretive Manual (mean = 100, SD = 15).

U.S.A. There is a statistically significant difference between the population studied and the general population when comparing the FSIQ, as well as in three of the subscales (FSIQ  $z = -3.18$ ,  $p = 0.001$ ; VCI  $z = -2.31$ ,  $p = 0.02$ ; PRI  $z = -2.43$ ,  $p = 0.01$ ; PSI  $z = -4.20$ ,  $p < 0.001$ ). Out of the 27 defendants, 18 were more than one standard deviation below the average. Nine of them were in the mental retardation range.

The only subscale in which the difference was not statistically significant was the Working Memory Index ( $z = -1.71$ ,  $p = 0.09$ ). Several recent studies concluded that adolescents rely more heavily on their working memory than adults do when asked to perform a series of mental tasks (11). There is the possibility that deficits in the processing speed could reduce the ability to suppress emotional responses in the studied group. Verbal deficits could increase frustration in expressing anger, predisposing them to respond with violent behaviors.

It is interesting to note that 11 subjects had a documented history of head injury, three of whom suffered loss of consciousness. Any or all of the following list of factors may confound the clinical picture: previous neurological insults such as *in-utero* exposure to substances or alcohol, high lead levels during the first years of life, head injuries, seizures, and/or other traumatic, metabolic, or infectious conditions affecting the central nervous system. Previous reports that have studied adolescents and adults have linked violence to a history of neurological conditions (1,12). It was suggested that homicidal children have an organic inferiority, coming from deprived environments, insurmountable educational difficulties, and severe family aggressiveness (2). It is possible that some of the violent youngsters have a history of severe physical abuse, causing neurological insults.

An important limitation in this study derives from the fact that only 27 cases were included in the analysis, which is not enough to form a general conclusion. This study is preliminary, and a follow-up is needed in order to have a higher sample number and more statistical power. Furthermore, in order to evaluate a causal association, prospective studies are needed. A second limitation is that we were not able to adjust for possible confounders such as age, sex, cultural and ethnical differences, socioeconomic status, or cause of violence; these are important factors which should be included in future studies. Furthermore, language and cultural bias in interpretation of test results is an inherent problem which will probably also affect future similar studies, despite the fact that many tests have been modified and standardized to account for cultural differences affecting the development of aptitudes, interests, motivation, attitudes, and other psychological characteristics of minority group members, and in special populations (13). A third

limitation of this study is that there is a possibility that the effects observed might reflect malingering or a lack of effort.

In summary, the subjects studied perpetrated violent crimes and have statistically significant intellectual deficits. IQ scores could be an important factor in violent criminal behaviors, and intellectual functioning tests should be routinely administered when assessing violent adolescents. Although violent teenagers may also have an array of predisposing factors, it is relevant to be aware of their cognitive functioning when examining them. Knowledge of their cognitive functioning could alert the clinicians, courts, lawyers, and educators who must deal with violent teenagers, and aid the legal system in adequately processing them. Cognitive functioning may influence their ability to control their impulsive behaviors, and their ability to participate in the adjudicative process such as in police interrogation, consultation with their attorney, and trial (14,15).

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#### **References**

1. Anderson SW, Bechara A, Damasio H, Tranel D, Damasio AR. Impairment of social and moral behavior related to early damage in human prefrontal cortex. *Nat Neurosci* 1999;2(11):1032–7.
2. Bender L. Children and adolescents who have killed. *Am J Psychiatry* 1959;116(4A):410–3.
3. Lewis DO, Shanok SS, Balla DA. Perinatal difficulties, head and face trauma, and child abuse in the medical histories of seriously delinquent children. *Am J Psychiatry* 1979;136(4A):419–23.
4. Miura H, Fujiki M, Shibata A, Ishikawa K. Influence of history of head trauma and epilepsy on delinquents in a juvenile classification home. *Psychiatry Clin Neurosci* 2005;59(6):661–5.
5. Wilson JQ, Herrnstein RJ. *Crime and human nature*. New York, NY: Simon and Schuster Publicity Manager, 1985.
6. Glueck S, Glueck E. *Delinquents and non-delinquents in perspective*. Cambridge, MA: Harvard University Press, 1968.
7. Herrnstein RJ. Some criminogenic traits of offenders. In: Rosner R, Schartz HI, editors. *Juvenile psychiatry and the law*. New York, NY: Plenum Press, 1989;13–28.
8. Quintana H. Cognitive development. In: Rosner R, editor. *Textbook of adolescent psychiatry*. Oxford: Hodder Arnold Publication, 2003;171–9.
9. Busch KG, Zagar R, Hughes JR, Arbit J, Bussell RE. Adolescents who kill. *J Clin Psychol* 1990;46(4):472–85.
10. Wechsler D. *WISC-IV Weschler intelligence scale for children technical and interpretive manual*, 4th edn. San Antonio, TX: The Psychological Corporation, a Harcourt Assessment Company, 2003.
11. Thompson PM, Sowell ER, Gogtay N, Giedd JN, Vidal CN, Hayashi KM, et al. Structural MRI and brain development. *Int Rev Neurobiol* 2005;67:285–323.
12. Pontius A. Neurological aspects of some types of delinquency, especially in juveniles. *Adolescence* 1972;7:289–308.
13. Elliot AS, Gular E. Psychological assessment. In: Rosner R, editor. *Textbook of adolescent psychiatry*. Oxford: Hodder Arnold Publication, 2003;231–6.
14. Grisso T, Steinberg L, Woolard J, Cauffman E, Scott E, Graham S, et al. Juveniles' competence to stand trial: a comparison of adolescents' and adults' capacities as trial defendants. *Law Hum Behav* 2003;27(4):333–63.
15. Steinberg L. <http://www.abanet.org/crimjust/juvjus/cjmag/18-3ls.html>; American Bar Association, 2006.

Additional information and reprint requests:

Manuel Lopez-Leon, M.D.  
276 1st Avenue, Suite 307-A  
New York, NY 10009  
E-mail: drlopezleon@mac.com