# An Estimate of the Prevalence of Autism-Spectrum Disorders in an Incarcerated Population

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## Abstract

In the current study, we used the Adult Autism-Spectrum Quotient (AQ) to assess the prevalence of autism-spectrum disorders (ASD) in a maximum-security prison in the United States.  Results indicated that, employing a conservative cutoff score, 4.4% of inmates may meet the criteria for a diagnosis of ASD.  While this finding is commensurate with previous research involving other criminal populations, it is four times greater than the rate of ASD in the general population.  The current study is the first to examine the prevalence of ASD in criminal populations with a U.S. prison population sample.  Given the important implications for both the judicial system and offender treatment, further research concerning the prevalence of ASD in forensic populations is needed.

*Keywords:* Autism, Asperger's Syndrome, sex offenders

## Introduction

Recently, researchers have begun to critically examine the prevalence of individuals diagnosed with Autism-Spectrum Disorders (ASD) within the criminal-justice system as well as the implications the diagnosis carries as they progress through legal proceedings (Browning & Caulfield, 2011).  This research adds to the numerous case studies that have addressed the relation between ASD and violent or sexual offending behavior (Baron-Cohen, 1988; Chesterman & Rutter, 1993; Haskins & Silva, 2006; Mawson, Grounds, & Tantam, 1985; Murrie, Warren, Kristiansson, & Dietz, 2002).  To start, Scragg and Shah (1994) examined the prevalence of Asperger's Syndrome (AS) in a special hospital in Britain and determined that 1.5% of the population could be diagnosed with AS.  In the event that equivocal cases were included, the prevalence rose to 2.3%.  Similar results were obtained in a later study of special hospitals in England (Hare, Gould, Mills, & Wing, 1999).  In this study, 2.4% of the population of three special hospitals met criteria for a diagnosis of ASD, which increased to 5.3% with equivocal or incomplete cases included.  Siponmaa, Kristiansson, Jonson, Nyden, & Gillberg (2001) examined the prevalence of various neuropsychiatric disorders in young adults referred for pre-sentencing evaluations in Sweden over a five-year period.  They determined none of their patients could be diagnosed with autism, but four percent could be diagnosed with AS.  When probable cases were included, the figure rose to ten percent.  These findings indicate significantly higher rates of ASD among those in criminal justice settings as compared to the general population.  In the United States, for

example, the prevalence of ASD is currently estimated at .9% (Centers for Disease Control [CDC], 2009).

While the aforementioned research has indicated a higher prevalence of those with ASD in various forensic settings, Mourisden, Rich, Isager, and Nedergaard (2008) conducted a retrospective case-control study of those with ASD. They found that, while those with autism were much less likely to be convicted of a crime (.9%) as compared to controls (18.9%), 18.4% of those with AS were convicted of criminal offenses as opposed to 19.6% of matched controls. The same study found those with AS were significantly more likely to commit arson, and there was a trend towards increased likeliness to commit sexual offenses. No differences were found, however, with respect to other offense types. In another, smaller community-based study, Woodbury-Smith, Clare, Holland, and Kearns (2006) found individuals with ASD were less likely to offend compared to a neuro-typical control group, but they were more likely to commit property damage or acts of violence than controls, who had a higher incidence of drug offenses.

Another potentially important implication of carrying a diagnosis of ASD in criminal justice proceedings deals specifically with disposition of the case. It has been argued the current handling of ASD within the criminal justice system is inconsistent and insufficient to effectively manage individuals with ASD (Browning & Caulfield, 2011). Due to a lack of knowledge on the part of an attorney, judge, or jury, an offender diagnosed with an ASD may be viewed more as a cold, remorseless recidivist, rather than a person with a mental-health diagnosis or neurobiological deficit. And while it should be assessed on an individual basis, those with severe ASD may also have cognitive deficits that would impact their competency-related abilities; a diagnosis of ASD could also be considered when assessing criminal responsibility or as a mitigating factor during sentencing (Browning & Caulfield, 2011).

Finally, in the event that the legal system diverts individuals with ASD who become involved in criminal proceedings into mental-health treatment, there is still the question of finding appropriate, effective services for them. Hare et al. (1999) found those with ASD were detained two to three years longer than those with other diagnoses in secure psychiatric settings. In this same vein, studies concerning treatment of those with ASD or other cognitive limitations have not always shown promising results. One study began with ten men with intellectual disabilities (six of whom had ASD) and sexual offending behavior (Murphy, Powell, Guzman, & Hays, 2007). A modified treatment group was offered on two occasions: two of the men with ASD who completed the yearlong group on the first occasion also repeated it on the second occasion. Despite the extensive treatment, one man with ASD continued his sexual-offending behavior throughout the time he attended both groups, and three men had committed new sexual offenses at six-month follow-up, all of whom were on the autism spectrum. If indeed those with ASD are over-represented in the criminal justice system and also detained longer, it is of utmost importance to develop effective treatments specifically for this population to reduce criminal behavior and recidivism rates.

**The Current Study**

To date, all existing studies concerning the prevalence of ASD in forensic settings have been conducted overseas; therefore, the generalizability of the prevalence rates to the United States criminal justice system is questionable.  In addition, studies conducted at secure psychiatric hospitals and with pre-sentencing evaluees are limited in the extent to which they can generalize to the broader criminal population.  The current study presents data concerning the prevalence of ASD of those incarcerated in a maximum-security prison in the Midwestern United States.  We hope to provide some indication that criminal behavior may be more common in individuals with ASD than what has historically been considered (Kohn, Fahum, Ratzoni, & Apter, 1998).

**Participants**

Approximately 1800 male inmates residing in a single maximum-security state prison in the Midwest were asked to participate in the survey.  Of this number, 431 (24%) completed the survey.  Participant age ranged from 19 to 74, ($M_{age}$ = 38, *SD* = 11.8). Participants had an average of 2 current convictions (*SD* = 2.3) and 1 prior conviction (*SD* = 2). The average current sentence was 15.8 years (*SD* = 12.2); the average previous sentence was four years (*SD* = 4.3).  Most participants (71.9%) scored 5 or higher on the Violence Rating Scale (VRS).  A complete description of the VRS follows. As can be seen in Table 1, however, this score was largely due to the sex offenders in the sample being almost entirely contact offenders.  The non-sexual offenders had a wider variety of convictions, such as convictions for driving violations and drug sales. The majority of the participants in this sample (59.9%) had current or prior convictions for sexual offenses.  This was partially due to the sampling method used for data collection; sex offenders were housed in separate housing units from non-sex offenders and not all housing units were sampled.  Please see Table 1 for demographic data reported as a single group as well as by offense group.

**Materials and Methods**

The Adult Autism-Spectrum Quotient (AQ; Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001) was administered to assess autism-spectrum traits.  The AQ is a 50-item self-report instrument designed with ten questions in each of five content areas. The content areas are social skills, attention switching, attention to detail, communication, and imagination (Baron-Cohen et al., 2001). Some subsequent analyses have supported a three-factor structure to improve internal consistency (Hurst, Mitchell, Kimbrel, Kwapil, & Nelson-Gray, 2007).  The three factors were best described as social skills, detail/patterns, and communication.  These areas match the "autistic triad" of symptoms reported in the DSM-IV-TR (American Psychiatric Association, 2000).  The initial psychometric assessment of the instrument demonstrated good test-retest reliability; ratings were also consistent between self-report and parent-report with self-report producing slightly more conservative scores (Baron-Cohen et al., 2001). Additionally, the AQ has been validated cross-culturally (Voracek & Dressler, 2006;

Wakabayashi, Baron-Cohen, Wheelwright, & Tojo, 2006) and with a clinical sample referred for suspected ASD (Woodbury-Smith, Robinson, Wheelwright, & Baron-Cohen, 2005) among others.

Previous research has shown the AQ is effective as a general population screener for ASD using a cutoff score of 32 (Baron-Cohen et al., 2001). However, Woodbury-Smith et al. (2005) determined a cutoff score of 26 was more effective when screening for ASD in clinical populations. In the current study, results are presented using the conservative cutoff score of 32, and in a continuous format where possible, because the optimal cutoff score for criminal populations has not been determined. As the existing research suggests, ASD may also be related to arson and sexual offending behavior; in particular, results for those convicted of sexual offenses will be analyzed separately. No participants had a conviction for arson, thus eliminating the need for analysis on this factor.

Demographic data (participant age, race/ethnicity, offense history, sentence, and educational/reading level) were provided by the State Department of Corrections and coded by the first author. The participants' most violent offense was also coded using the Violence Rating Scale (VRS; Young, Justice, & Erdberg, 1999). A rating of "1" on the Violence Rating Scale indicates a non-violent crime; a rating of "2" indicates ambiguous violence such as escape or theft; a rating of "3" indicates a property crime. At ratings of "4" and above, the crimes become more violent, with a "4" indicating threat of violence. Attacks on persons receive a rating of "5," crimes involving a loss of life are rated as a "6," and the rating of "7" is reserved for extreme violence, such as serial murder (Young et al., 1999). The purpose of the VRS was to provide the most efficient manner of quantifying the array of offenses present in the current study's sample.

The study was announced in the participants' housing units. Potential participants assembled in the common area. The researcher read a script explaining the project while the surveys were distributed. At the conclusion of the testing script, participants were free to ask questions and agree or decline to participation. All participants signed informed consent forms, which were approved by both Forest Institute and the Department of Corrections. Upon receipt of consent, demographic data were obtained from inmates' electronic files within the Department of Corrections.

## Results

The mean AQ score was 20 (*SD* = 6.4). Using the cutoff score of 32, 4.4% of the sample (*n* = 19) may meet criteria as having an ASD[1]. Unfortunately, definitive diagnosis was not possible due to lack of access to protected health information and independently validated developmental data. Assuming similar psychometric

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[1] In the initial study, 80% of those with ASD scored in this range as opposed to only 2% of the general population. In the validation study in a clinical sample, both the sensitivity and specificity at this cutoff were approximately 75% resulting in a correct classification rate of 76%.

functioning to the initial and validation studies, however, the majority of these individuals are likely correctly classified (Baron-Cohen et al., 2001; Woodbury-Smith et al., 2005). While the distribution of AQ scores was approximately normal, the distribution of a number of other variables was not, leading to some non-parametric tests being used for statistical analyses.  Please refer to Table 2 for a distribution of Adult Autism-Spectrum Quotient scores.

Correlations were conducted between AQ and all demographic variables. AQ showed a marginally significant correlation with age (Spearman's $r$ = .10, $p$ = .047). In addition, age was significantly correlated with eduation (Spearman's $r$ = -.21, $p$ < .001). The effect of race on AQ was examined by collapsing participants into Caucasian and non-Caucasian categories in order to have a sufficient sample size in both categories; differences between groups were then assessed. Independent samples t-test indicated that the two groups differed significantly on mean AQ score: $t$(189.8) = 3.32, $p$ = .001, with the Caucasian participants having a higher score ($M$ = 20.5, $SD$ = 6.6) than the non-Caucasian participants ($M$ = 18.4, $SD$ = 5.2). A second independent samples t-test was conducted to determine if convicted sex offenders scored significantly different on the AQ compared to non-sex offenders. Results revealed higher mean AQ scores for the sex-offender group compared to non sex offenders: $t$(419) = -2.1, $p$ = .038 ($M$ = 20.5, $SD$ = 6.9; $M$ = 19.3, $SD$ = 5.4, respectively).

A series of linear regressions was performed to explore the predictive ability of age, race, education, and sex-offender status to explain AQ score. The first linear regression explored the effects of the demographic variables (age, race, and education) on AQ. The Model was significant: $F$(3, 415) = 9.1, $p$ < .001, explaining 5.5% of the Model's variance. A second regression was performed with sex-offender status added. This Model was also significant: $F$(4, 414) = 7.4, $p$ < .001, explaining 5.8% of the variance. In order to determine if sex-offender status was adding predictive utility to the first Model, a hierarchical linear regression was conducted with the demographic variables in step one and sex-offender status in step two. The difference between the steps was not significant: $F$change(1, 414) = 2.3, $p$ = .133. This suggests that the relation between sex-offender status and higher AQ score is a result of demographic variables, as sex offenders were more likely to be Caucasian ($\chi^2$ (1, $n$ = 431) = 17.02, $p$ < .001), were significantly older ($M$ = 41.3 and 33.3, respectively, $U$ = 13454.5, $z$ = -6.99, $p$ <.001), and had a different distribution of eduational levels ($\chi^2$ (3, $n$ = 419) = 16.31, $p$ = .001). Specifically, 26.4% of the non-sex offenders had less than a high school education compared to 13.1% of the sex offenders. Alternately, while 10.2% of the non-sex offenders completed college, 19.8% of the sex offenders had done so.

## Discussion

As per normed data on the AQ, the inmates in the current study had a higher rate of autism-spectrum disorders compared to the general population.  Even using a conservative cutoff score of 32, the estimated rate of ASD would be 4.4%, which is four times more than that of the general population in the United States.  These results are

particularly remarkable given the recent increase in the diagnosis of autism-spectrum disorders in the US. Per the age of the participants in this study, they are not demographically a large part of the "autism boom" of the 90's. This makes their estimated prevalence of ASD even higher relative to their age cohort.

This finding is strikingly similar to the preliminary research by other authors concerning the prevalence of ASD in criminal populations. While the three other studies (Hare et al., 1999; Scragg & Shah, 1994; Siponmaa et al., 2001) regarding the prevalence of ASD in criminal settings have been performed in different countries, using different methods of diagnosis, in different criminal settings, and with different age groups, all have found a prevalence of ASD between 1.5% and 5.3%, or higher with equivocal cases included. This relatively stable estimate may indicate that those with ASD are, indeed, overrepresented in criminal settings at the rate of approximately 3-4%, on average. As previously mentioned, the interaction of those with ASD with the legal system raises important questions not only on the front end of judicial proceedings, such as issues relating to competency and criminal responsibility, but also indicates a need for mental-health professionals to address the specific treatment needs of this population to reduce criminal behavior and recidivism.

Several demographic variables correlated with AQ. The correlation of AQ score with education is not unexpected. Those with more autism-spectrum traits are generally increasingly likely to have either intellectual impairments or behavioral issues that would interfere with their educational/reading level. The slight correlation with age is somewhat harder to explain, but one explanation could be the likelihood that older individuals may be less concerned with social norms and more comfortable pursuing solitary hobbies or more set in one's routines compared to their younger counterparts. Alternately, length of incarceration was not measured in this study, so this tendency for solitary activity and routine could also be explained by more adaptation to a correctional lifestyle. Other studies (CDC, 2009) have shown that Caucasian children do have a higher prevalence rate of ASD (9.9 per 1,000) compared to both African-American (7.2 per 1,000) and Hispanic children (5.9 per 1,000), making the higher AQ score among Caucasian participants also expected. While AQ did correlate with these variables, the correlations, although statistically significant, were small, and explained only 5.5% of the variance in AQ score. Despite the existing case-study literature suggesting otherwise, sex-offender status accounted for no significant portion of the variance in AQ score above that explained by demographic variables.

Although the current study is significant in that it helps to further solidify the emerging research concerning the prevalence of ASD in criminal populations, it does have a number of limitations. The AQ may benefit from revision in order to achieve maximum effectiveness with a criminal population, particularly with sex offenders. Two of the items on the AQ ask about finding it easy to play games involving pretending with children. These items were frequently skipped by the participants who were sex offenders, the majority of whom were convicted of child molestation. Additionally, as the AQ has not yet been validated with criminal or forensic populations, it is impossible to

be certain what cutoff score yields the most accurate estimate of ASD in this population. Further, this study did have a relatively low participation rate (24%). This could lead to bias in the sample. The low participation rate is believed to be largely due to mistrust of the prison system among the inmates. When some units were surveyed, it was noted that legally minded inmates would attempt to dissuade others from participating. This seemed to be due to a fear that the collected information could be used against them in some way, such as civil commitment. Lack of an incentive also reduced interest among the potential participants.

The self-selected nature of the participants could also introduce bias into the sample for other reasons. For example, the selection method could have reduced the estimated prevalence of ASD in the sample, as those with ASD tend to dislike changes in routine. Participation in this study was certainly a change in the normal prison routine. Similarly, the demographic features of this particular sample are not representative of the general prison population of the US. This sample tended to be older and Caucasian (average age 38 years and 78% Caucasian) compared to that of the total prison population of the U.S. (51% under 35 years old; 33% Caucasian; Bureau of Justice Statistics, 2010). This is partially due to the over-representation of sex offenders in this sample, which tended to be older and have a high proportion of Caucasian offenders, although the racial demographics are also representative of the state in which the data were collected. The different demographic features and the single physical location of the sample could indicate that results would not generalize to other criminal populations.

The prevalence of ASD in a general prison or jail population has yet to be fully established. Although research has been performed concerning the prevalence of these disorders in secure hospitals, young offenders, and now a sample from a maximum-security prison, these findings are all from very specific subsets of the general criminal population. Additionally, each of the studies has been performed in a different country using different assessment methods. Despite these methodological disparities, all have shown similarly elevated rates of ASD in criminal populations. This has a number of implications for the criminal justice system as ASD could conceivably impact competency to stand trial, provide a basis for an insanity defense, or be accepted as a mitigating factor during sentencing (see Barry-Walsh & Mullen, 2004, and Browning & Caulfield, 2011, for a discussion of these possibilities). Given the important implications for both the judicial system and for offender treatment, further research concerning the prevalence of ASD in forensic populations should be of high priority. The rapidly increasing prevalence rates of ASD may be foreshadowing a looming issue for forensic psychologists and the criminal justice system in general.

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*Table 1.* Demographic Characteristics – Total and Offense Group – *N* = 431

| Demographic Characteristics | Sex Offenders | Non-Sex Offenders | Total |
|---|---|---|---|
| Race/Ethnicity (%) | | | |
|     Caucasian | 84.5 | 67.6 | 77.7 |
|     Non-Caucasian | 15.5 | 32.4 | 22.3 |
| Age (SD) | 41.3 (11.8) | 33.27 (9.9) | 38 (11.8) |
| Total Current Convictions (SD) | 2.3 (2.0) | 2.3 (2.6) | 2.3 (2.3) |
| Total Previous Convictions (SD) | .65 (1.7) | 1.2 (2.3) | .86 (2) |
| Average Current Sentence (years, SD) | 16.9 (11.3) | 14.3 (13.4) | 15.8 (12.2) |
| Average Past Sentence (years, SD) | 4.0 (3.7) | 4.0 (4.9) | 4 (4.3) |
| Reading/Education Level (%) | | | |
|     < 6$^{th}$ grade | 8.3 | 14.4 | 10.7 |
|     ≥ 6$^{th}$ grade | 4.8 | 12.0 | 7.6 |
|     HS/GED | 67.1 | 63.5 | 65.5 |
|     College Degree | 19.8 | 10.2 | 16.2 |
| Violence Rating Scale – Highest Offense (%) | | | |
|     Level 1 | 0 | 21.4 | 8.6 |
|     Level 2 | 0 | 11.0 | 4.4 |
|     Level 3 | 0.4 | 18.5 | 7.7 |
|     Level 4 | 1.9 | 15.6 | 7.4 |
|     Level 5 | 96.1 | 21.4 | 66.1 |
|     Level 6 | 1.6 | 12.1 | 5.8 |

*Note.* Those whose educational/reading level could not be determined (2.6% of the sample) were not included under reading/education level.

*Table 2.* Distribution of Adult Autism-Spectrum Quotient Scores

| AQ Scores | Frequency | Percent |
| --- | --- | --- |
| 3 | 1 | .2 |
| 4 | 1 | .2 |
| 5 | 1 | .2 |
| 6 | 1 | .2 |
| 7 | 4 | .9 |
| 8 | 2 | .5 |
| 9 | 9 | 2.1 |
| 10 | 8 | 1.9 |
| 11 | 8 | 1.9 |
| 12 | 11 | 2.6 |
| 13 | 12 | 2.8 |
| 14 | 24 | 5.6 |
| 15 | 20 | 4.6 |
| 16 | 25 | 5.8 |
| 17 | 31 | 7.2 |
| 18 | 30 | 7.0 |
| 19 | 28 | 6.5 |
| 20 | 29 | 6.7 |
| 21 | 25 | 5.8 |
| 22 | 21 | 4.9 |
| 23 | 22 | 5.1 |
| 24 | 14 | 3.2 |
| 25 | 18 | 4.2 |
| 26 | 15 | 3.5 |
| 27 | 16 | 3.7 |
| 28 | 9 | 2.1 |
| 29 | 7 | 1.6 |
| 30 | 7 | 1.6 |
| 31 | 13 | 3.0 |
| 32 | 8 | 1.9 |
| 33 | 3 | .7 |
| 34 | 3 | .7 |
| 35 | 2 | .5 |
| 36 | 1 | .2 |
| 37 | 1 | .2 |
| 43 | 1 | .2 |