REVIEW

OPEN

Template to Perpetrate: An Update on Violence in Autism Spectrum Disorder

David S. Im, MD

Introduction: For the past two decades, researchers have been using various approaches to investigate the relationship, if any, between autism spectrum disorder (ASD) and violence. The need to clarify that relationship was reinforced by the tragic mass shooting at Sandy Hook Elementary School in Newtown, Connecticut, in December 2012 by an individual diagnosed with Asperger's syndrome. The purpose of this article is (1) to provide an updated review of the literature on the association between ASD and violence, and (2) to examine implications for treating, and for preventing violence by, individuals with ASD.

Method: A review of all published literature regarding ASD and violence from 1943 to 2014 was conducted using electronic and paper searches.

Results: Although some case reports have suggested an increased violence risk in individuals with ASD compared to the general population, prevalence studies have provided no conclusive evidence to support this suggestion. Among individuals with ASD, however, generative (e.g., comorbid psychopathology, social-cognition deficits, emotion-regulation problems) and associational (e.g., younger age, Asperger's syndrome diagnosis, repetitive behavior) risk factors have been identified or proposed for violent behavior.

Conclusions: While no conclusive evidence indicates that individuals with ASD are more violent than those without ASD, specific generative and associational risk factors may increase violence risk among individuals with ASD. Further research would help to clarify or confirm these findings, suggest potential directions for evaluation, treatment, and prevention, and potentially provide compelling empirical support for forensic testimony regarding defendants with ASD charged with violent crimes.

Keywords: Asperger's syndrome, autism spectrum disorder, autistic disorder, pervasive developmental disorder, violence

The tragic shooting of 20 children and 6 adults at Sandy Hook Elementary School in Newtown, Connecticut, in December of 2012 by Adam Lanza, an individual diagnosed with Asperger's syndrome (AS), has reinforced the need to clarify the relationship, if any, between autism spectrum disorder (ASD) and violence. Violent behavior by individuals with ASD has been noted as early as 1944, when Hans Asperger[1(p 40)] described the case of Fritz V., a boy with severe social-interaction deficits who would quickly lash out at peers "with anything he could get hold of (once with a hammer), regardless of the danger to others." Other instances of violence committed by individuals with known or suspected ASD have been reported in the mental health literature[2–27] and in the media.[13] Over the last two decades, the interest in this topic has increased, but research has yielded inconsistent or, at best, inconclusive evidence regarding any association between ASD and violence.

ASD symptoms were first described by Leo Kanner[28] in 1943 in his report of young children displaying a lack of affective contact with others, muteness or abnormalities of language, intense resistance to changes in routine, and a fascination with atypically manipulating objects. He called this condition *early infantile autism*. One year later, Hans Asperger[1] reported in German on a group of boys with significant social problems and idiosyncratic interests but with normal cognitive skills. He used the term *autistic psychopathy* to connote this pattern of deficits. While diagnoses capturing Kanner's and Asperger's descriptions (autistic disorder and Asperger's disorder, respectively) were included as discrete entities in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV),[29] the two conditions were subsequently collapsed into the single designation of *autism spectrum disorder* in DSM-5.[30] The DSM-5[30] criteria for ASD require persistent deficits in social communication and interaction along

From the University of Michigan Medical School and Center for Forensic Psychiatry, Saline, MI.

Original manuscript received 14 May 2014, accepted for publication subject to revision 5 December 2014; revised manuscript received 6 January 2015.

Correspondence: David S. Im, MD, 8303 Platt Rd., Saline, MI 48176. Email: imd@michigan.gov

DOI: 10.1097/HRP.0000000000000087

with restricted patterns of behavior, interests, or activities, beginning in the early developmental period and causing significant functional impairment; intellectual and language impairment may or may not be present.

It is important to distinguish ASD from other disorders that can present with social-interaction abnormalities and restricted interests. For example, individuals with schizoid personality disorder typically present with isolation due to disinterest in interpersonal relationships, and individuals with schizotypal personality disorder commonly present with acute discomfort with close relationships, and with magical thinking. Although similar in some respects to these other two disorders, ASD differs in others. Compared to people with schizoid personality disorder, those with ASD often have a desire to make friends or have intimate relationships, but their profound social-skills deficits render them unable to appropriately engage, empathize with, or respond to others. And compared to people with schizotypal personality disorder, the social-interaction difficulties of those with ASD are rooted in empathic and perspective-taking deficits rather than excessive social anxiety associated with paranoid fears. In addition, the preoccupations of individuals with ASD usually involve themes (e.g., weather reports, sports statistics) that, while unusual in intensity or focus, are not typically bizarre or magical, unlike what happens in schizotypal personality disorder.

For purposes of this review, the phrase *autism spectrum disorder* (ASD) refers to conditions meeting DSM-5[30] criteria for autism spectrum disorder, DSM-IV-TR[31] or DSM-IV[29] criteria for autistic disorder, Asperger's disorder, or pervasive developmental disorder not otherwise specified (PDD-NOS), International Classification of Diseases, tenth revision (ICD-10)[32] criteria for autistic disorder or Asperger's syndrome, or Gillberg and Gillberg[33] criteria for Asperger's syndrome.* *Violence* is defined as intentional threats, attempts, or infliction of bodily harm on another person.

According to the Centers for Disease Control and Prevention,[34] the prevalence of ASD among eight-year-old children in the United States in 2010 was 1.47%, representing a 30% increase from 2008 estimates (1.14%). The recent increase in ASD prevalence further underscores the need to clarify the relationship between ASD and violence.

Efforts in this regard have been under way for over two decades, using a variety of research approaches. The purpose of this article is to (1) provide an updated review of the literature on the association between ASD and violence, and (2) examine implications for treating, and for preventing violence by, individuals with ASD.

*The Gillberg and Gillberg[33] criteria were the first diagnostic criteria for AS. They closely resemble Asperger's original description, and require difficulties in six domains, including reciprocal social interaction, narrow interests, imposition of routines and interests on self or others, speech and language problems (including delayed development, formal/pedantic language, or odd speech prosody), nonverbal communication, and motor clumsiness. These criteria differ from DSM-5[30] and ICD-10[32] criteria in that the latter do not require speech/language abnormalities and motor clumsiness, and preclude the presence of language and cognitive delays.

METHOD

Using electronic databases (PsycINFO, PsycARTICLES, MEDLINE) and article searches (the latter based on reviews of reference lists), all published literature was searched using the terms autism, autistic disorder, high-functioning autism, autistic spectrum disorder, Asperger's, Asperger's disorder, Asperger's syndrome, and pervasive developmental disorder, all individually cross-referenced with the terms violence, aggression, murder, rape, assault, criminal, crime, and offending, from 1943 to 2014. Only reports describing violent behavior in association with ASD were included for analysis. Reports excluded from analysis included (1) those not published in English, (2) those focused on behavior that did not involve violence toward others, (3) those in which no clear diagnosis of ASD was made for the individual(s) in question, and (4) those whose objective did not specifically relate to clarifying the relationship between violence and ASD, including those focused on treatment.

The original electronic search yielded 1396 reports. Based on a review of titles and abstracts, 1327 of these were excluded (91 were not published in English; 426 did not focus on violence toward others; 746 involved no clear ASD diagnosis for the individual(s) in question; and 64 were treatment focused). The remaining 69 reports were subsequently ordered and reviewed in full. Based on this further review, another 16 records were excluded (four did not address violence toward others; five did not focus on individuals with ASD; and eight did not relate to clarifying the relationship between violence and ASD [for example, one[35] was an editorial letter with a treatment focus; another[36] was a book review that was felt not to contribute relevant information on ASD and violence; and a third[37] examined the moderating effect of aggression and social understanding on anxiety levels in individuals with ASD as a function of IQ and did not specifically have aggression as its focus]). This process resulted in the inclusion of 53 reports from the electronic search. Analysis of reference lists from these reports resulted in an additional 12 articles being ordered and reviewed, with the consequence that, in total, 65 articles were reviewed and used to study the association between ASD and violence. Figure 1 presents a schematic of the search process for this review.

RESULTS

Studies on the association between ASD and violence can be grouped into three categories: (1) descriptive case reports, (2) prevalence studies, and (3) reviews with theoretical explanations for violence in individuals with ASD.

Descriptive Case Reports

Table 1 summarizes the descriptive case reports that were reviewed regarding violence in individuals with ASD.

A total of 27 case reports involving 48 individuals were identified, providing a detailed description of violent behavior associated with ASD. As seen in Table 1, the majority

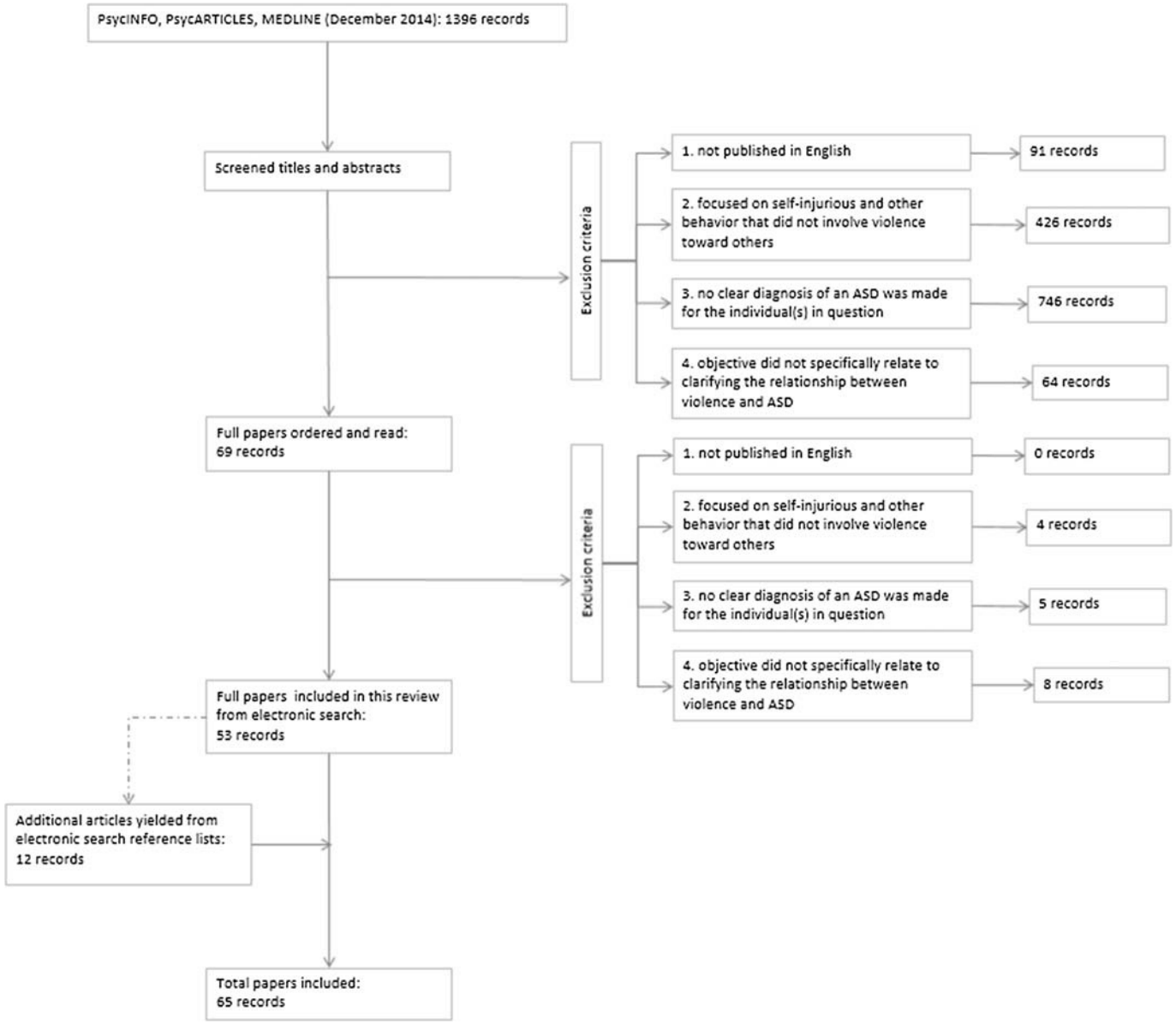

Figure 1. Schematic of search process for review of ASD-violence relationship.

of individuals in these reports had a diagnosis of AS. The violence included physical assaults,[1–4,6,8–10,12,19,23–27] sexual assaults,[6–8,11–13,18,20] arson,[5,12,18,22] murder,[13,14,16,17,21] and stalking/violent threats.[15,19,23]

Many of these reports posit features of ASD that could increase the likelihood of violent behavior, such as impaired abilities (or the application thereof) to understand and appreciate others' mental states (impaired theory-of-mind abilities);[3–8,11,12,18] difficulty appropriately perceiving nonverbal cues;[2,18,19] and intense, restricted interests.[4,13,18,22] Other case studies have highlighted comorbid psychiatric disorders as increasing violence risk in ASD, including attention-deficit/hyperactivity disorder,[15] depression,[13,15] bipolar disorder,[10,15,25] psychotic disorders,[21,27] and personality disorders.[13,26] Although Palermo[15] notes that in the general population, violence risk is also increased by substance abuse, only one of the case reports[22] cited this factor as relevant to the violence described.

While these descriptive reports are helpful in raising awareness of, and plausible mechanisms behind, violent behavior in ASD, they do not constitute systematic attempts to clarify whether individuals with ASD are more violent than others, or what factors in those with ASD increase violence risk. Prevalence studies have aimed to more adequately address these questions.

Prevalence Studies

Table 2 summarizes prevalence studies to date that have examined the relationship between ASD and violence. Seventeen such studies were identified.

Table 1

Descriptive Case Reports of Violence Associated with Autism Spectrum Disorder

Study	Diagnosis	Nature of violent behavior	Comments
Asperger (1943)[1]	Asperger's syndrome	Physical assaults on peers	"Pronounced destructive urge," severe social-interaction deficits
Mawson et al. (1985)[2]	Asperger's syndrome (41 y.o. man in high-security hospital)	Physical assaults: entered neighbor's house with knife when angered by her dog's barking & struck her w/screwdriver; assaulted crying child at railway station by placing hands over child's mouth to stop noise of crying	People w/Asperger's syndrome unable to perceive meaning or implications of others' nonverbal behavior; many violent people admitted to secure units may have undiagnosed Asperger's syndrome
Baron-Cohen (1988)[3]	Asperger's syndrome (21 y.o. man)	Physical assaults on 71-year-old girlfriend	Violence due to "social cognitive deficit" consisting of inability to appreciate others' mental states; people w/Asperger's syndrome may end up in secure settings due to violence
Tantum (1988)[4]	Autism & Asperger's syndrome (majority of a sample of adults w/lifelong eccentricity & social isolation)	Physical assaults on mothers (9 subjects) for trivial reasons (e.g., food not ready when expected) Physical assaults on others in context of morbid preoccupation with violence (3 subjects)	Violent subjects felt to have no empathic grasp of victim's distress
Everall & Lecouteur (1990)[5]	Asperger's syndrome (17 y.o. boy)	Arson (repeated acts)	Empathic deficits & anxiety over future placement were factors in fire-setting behavior
Chesterman & Rutter (1993)[6]	Asperger's syndrome	Physical assault on police officer who accused him of theft while he was in another person's home watching lingerie spinning in a washing machine	Intense, obsessional interests thought to underlie violent behavior
Cooper et al. (1993)[7]	Asperger's syndrome (38 y.o. man)	Sexual assault of female stranger on bus	Empathic & perspective-taking deficits, combined with sexual preoccupations, were related to behavior
Kohn et al. (1998)[8]	Asperger's syndrome (16 y.o. boy)	Physical assaults on young boy & old man Sexual assaults (grabbed female stranger on street, tried to undress her, touched breast/genitals; later explained behavior as his expression of fondness & way of making her his girlfriend)	Based on a computerized test of understanding social situations, impaired *application* of theory-of-mind abilities is problematic in persons with Asperger's syndrome—rather than impaired theory-of-mind abilities per se
Bankier et al. (1999)[9]	Asperger's syndrome (26 y.o. man)	Physical assaults on mother	Diagnosis of Asperger's syndrome missed through multiple hospitalizations, despite severe social-interaction impairment & restricted, repetitive patterns of behavior for 14 years
Frazier et al. (2002)[10]	Asperger's disorder (13 y.o. boy)	Physical assaults on siblings & others	Comorbid bipolar disorder was significant factor that increased risk of violence
Milton et al. (2002)[11]	Asperger's syndrome	Sexual assault	Empathic deficits & sexual preoccupations were related to behavior

Continued on next page

Table 1

Continued

Study	Diagnosis	Nature of violent behavior	Comments
Murrie et al. (2002)[12]	Asperger's syndrome (31 y.o. man)	Arson (set fire to numerous homes as means of exacting revenge on schoolmates who had harassed him during youth; no actual relationship between homes & these peers, but trivial details of homes reminded him of peers)	Intense preoccupation with those who had wronged him was critical in driving fire-setting behavior
	Asperger's syndrome (27 y.o. man)	Sexual assault on male minor	Intense sexual preoccupations, poor social skills & vulnerability to manipulation were possible factors in offense
	Asperger's syndrome (44 y.o. man)	Physical assault (attempted murder; shot psychologist involved in child custody evaluation in head)	Intense, restricted interests, cognitive inflexibility & impaired abstract thinking were possible factors in violence
	Asperger's syndrome (33 y.o. man)	Sexual assault on 9 y.o. daughter & her peer	Intense, restricted interests, empathic deficits & comorbid pedophilia were factors in offense
	Asperger's syndrome (22 y.o. man)	Sexual assault	Empathic & severe social-interaction deficits were noted
	Asperger's syndrome (31 y.o. man)	Physical assault (on two women at a zoo restroom)	Empathic & severe social-interaction deficits, along w/intense & aggressive sexual fantasies, were factors in offense
Silva et al. (2002)[13]	Asperger's syndrome	Serial homicide & sexual assault	Deficits in theory of mind, empathy & social reciprocity, along w/restricted/ repetitive interests & comorbid psychopathology, formed foundation for sexual serial-killing behavior
Silva et al. (2003)[14]	Asperger's syndrome	Murder (multiple victims in bombing of public building)	Theory of mind, empathy & social reciprocity deficits, along w/restricted interests, were factors in violence
Palermo (2004)[15]	PDD-NOS (19 y.o. man)	Threat to kill police officer	Comorbid ADHD drove trespassing & window-peering behavior that led to police involvement
	Asperger's syndrome (33 y.o. man)	Threat to burn down grandmother's home	Comorbid depression & anxiety about possible change in living arrangements drove behavior
	Asperger's syndrome (30 y.o. man)	Sexual assault of prepubescent boy	Hypersexuality in context of manic episode and interpersonal intrusiveness related to autism spectrum disorder were major factors in behavior
Schwartz-Watts (2005)[16]	Asperger's disorder (22 y.o. man)	Murder (shot 8 y.o. boy who had run over his foot w/bicycle)	Tactile/sensory hypersensitivity was significant factor in violence
	Asperger's disorder (35 y.o. man)	Murder (shot victim numerous times after victim struck him in face, hitting his glasses)	
	Asperger's disorder (20 y.o. man)	Murder (shot girlfriend's father who was attempting to return some belongings to him; misread victim's facial expression as intending to harm him)	Misinterpretation of nonverbal social cues was factor in violence; history of sensory hypersensitivity (e.g., sound of radio)

Continued on next page

Table 1

Continued

Study	Diagnosis	Nature of violent behavior	Comments
Silva et al. (2005)[17]	Asperger's syndrome	Murder (serial homicide)	Deficits in theory of mind, central coherence, empathy & social reciprocity, along w/restricted interests & paraphilic tendencies, were all factors in violence
Haskins & Silva (2006)[18]	Asperger's syndrome	Arson (fire killed daughter)	Theory-of-mind deficits, poor social reciprocity, or restricted, narrow interests were factors in offending in all three cases
	Asperger's syndrome	Sexual assault (inappropriate touching of female students)	
	Asperger's syndrome	Sexual assault (male strangers in public restrooms)	
Katz & Zemishlany (2006)[19]	Asperger's syndrome (38 y.o man)	Threats to kill female stranger whom he had fallen in love with because eyes happened to meet	Significant deficits in social understanding, cognitive flexibility & empathy in all three cases
	Asperger's syndrome (22 y.o. man)	Physical assaults on family members	
	Asperger's syndrome (30 y.o. man)	Threats to a girl Physically assaultive at home	
Griffin-Shelley (2010)[20]	Asperger's syndrome (14 y.o. boy)	Sexual assaults on younger children	Comorbid anxiety & sexual compulsions fueled behavior
Murphy (2010)[21]	Autism spectrum disorder (21 y.o. man)	Murder (stabbed & killed work supervisor whom he blamed for overcriticizing his work & reporting him to the restaurant manager after he punched a teenage girl for taunting him at work)	Theory-of-mind & empathy deficits, poor emotion regulation (anger at teenagers taunting him, anxiety about losing job), overly rigid adherence to rules/routines & comorbid psychotic symptoms were all factors in violence
Radley & Shaherbano (2011)[22]	Autism spectrum disorder (24 y.o. man)	Arson Physical assaults	Social-skills deficits, restricted interests (fires, witchcraft), comorbid psychotic symptoms & comorbid alcohol abuse all contributed to violent behavior
Tochimoto et al. (2011)[23]	Asperger's disorder (16 y.o. boy)	Physical assaults on men who reminded him of peer who had bullied him years ago	Clear recall & present reexperiencing of trivial events from many years ago & associated feelings ("time-slip" phenomenon) thought to underlie violence
	Asperger's disorder (27 y.o. man)	Threats to hurt neighbor with sword due to annoyance from past memory of neighbor throwing away cigarette butt in front of home	
White et al. (2011)[24]	Autism spectrum disorder (autism, 7 y.o. boy)	Grabbing & biting when particular toy visible but not available	In both cases, aggression was maintained by access to toy that was then used to engage in repetitive (stereotypical) behavior
	Autism spectrum disorder (autism, 7 y.o. boy)	Grabbing & pulling when particular toy visible but not available	
Singh & Coffey (2012)[25]	PDD-NOS (17 y.o. boy)	Physical aggression toward caregivers & others	Disruption of routines triggered violence; comorbid bipolar disorder drove hypersexual behavior
Baliousis et al. (2103)[26]	Autism spectrum disorder (21 y.o. man)	Physical assault on girl who transferred affections elsewhere (stabbed with two knives, nearly fatal)	Poor emotion regulation (anxiety & vengeful anger), misinterpretation of others' verbal & nonverbal behavior, & comorbid personality disorder were factors in violent behavior
Frank (2013)[27]	Asperger's syndrome (11 y.o. boy)	Physical assaults on mother	Poor emotion regulation & comorbid psychotic symptoms raised violence potential

ADHD, attention-deficit/hyperactivity disorder; PDD-NOS, pervasive developmental disorder not otherwise specified.

Table 2

Prevalence Studies Examining Relationship Between Autism Spectrum Disorder and Violence

Study	Study type	Violence-detection method	Subjects	Comparison group w/o ASD?	Findings
Ghaziuddin et al. (1991)[38]	Review of all published reports on clinical features of AS from 1944 to 1990 (n = 132 patients)	Review of published articles on individuals w/AS to see if history of violent behavior was documented	Individuals w/AS	No	Violence in 2.27%–5.58% of individuals; since rate is similar to that in general population, no special association between AS & violence
Scragg & Shah (1994)[39]	Screening of all male patients in maximum-security forensic hospital (n = 392) for AS	Subjects were residing in secure hospital (study population violent)	Maximum-security inpatients being screened for AS	No	AS in 1.5%–2.3% of maximum-security inpatients; since rate is significantly higher than that in general population (0.36%), AS overrepresented in forensic settings; possible increased violence risk in AS
Hare et al. (2000)[40]	Screening of all male patients in 3 maximum-security forensic hospitals (n = 1305) for ASD; initial ASD screening questionnaire followed by chart review	Subjects were residing in secure hospital (study population violent)	Maximum-security inpatients being screened for ASDs	No	ASD in 2.4%–5.3% of maximum-security inpatients; since this rate is significantly higher than ASD rate in general population (0.71%), ASD overrepresented in forensic settings
Siponmaa et al. (2001)[41]	Retrospective review of presentencing forensic psychiatric investigations of offenders over 5-year period in Sweden (n = 126)	Subjects were violent offenders referred for presentencing forensic psychiatric investigations	15–22 y.o. offenders referred for presentencing forensic psychiatric investigations being screened for ASD (including AS & PDD-NOS)	No	Definite ASD in 15%; definite AS in 3%; thus ASD overrepresented among offenders referred for pre-sentencing forensic psychiatric investigations
Soderstrom et al. (2005)[42]	Screening of adults admitted by court order to forensic psychiatric institution in Sweden from 1998 to 2001, all under prosecution for severe violent/sexual crimes (n = 100)	Subjects were under prosecution for severe violent/sexual crimes & court ordered to a forensic psychiatric institution	Adult inpatients (17–76 y.o.) under prosecution for severe violent/sexual crimes being screened for autism, AS, atypical autism	No	Autism in 5%; AS in 3%; atypical autism in 10%; therefore, ASD in 18% overall
Woodbury-Smith et al. (2006)[43]	Screening of persons w/ASD in community (n = 25) for history of violence using self-report questionnaire & conviction data, compared to adult volunteers w/o ASD (n = 20) from local large company	Self-report questionnaire & Home Office Offenders' Index (UK)	Individuals w/ASD (high-functioning autism & AS) living in the community	Yes	Violence history in 30% of ASD group, similar to comparison group (25%)

Continued on next page

Table 2

Continued

Study	Study type	Violence-detection method	Subjects	Comparison group w/o ASD?	Findings
Allen et al. (2008)[44]	Survey-based (subjects & informants) study of prevalence of offending in 126 adults with ASD (AS) from large geographical area of South Wales, UK; AS diagnoses confirmed with ASDI	Subject & informant surveys	Adults w/ASD recruited from independent living, prisons, mental health facilities, specialist autism & learning disability services; included those diverted out of criminal justice systems	No	Offending behavior (over 80% of which is violent) in 26% of adults w/ASD; comorbid psychiatric disorders common (schizophrenia 25%, depression 12.5%, ADHD 18.75%); no evidence of clear association between ASD & offending (due to conflicting reports of ASD prevalence in general population)
Mouridsen et al. (2008)[45]	Register-based study comparing adults w/ASD (all former child psychiatric inpatients; n = 313) with 933 controls from general population (matched for age, gender, place of birth, social group) on conviction rates for various crimes	Conviction rates	Adults (infantile autism, atypical autism, AS) w/ASD in the community	Yes	Violence in 0.88% of infantile autism group, 4.6% of atypical autism group & 7.6% of AS group; differences compared to controls significant only for arson (more common in AS)
Langstrom et al. (2009)[46]	Register-based study comparing historically violent & nonviolent individuals w/ASD (≥15 y.o.; n = 422) on sociodemographic variables & presence of comorbid psychopathology	Conviction rates	Individuals w/ASD (autism or AS) hospitalized for various reasons	No, but examined risk factors for violence among individuals with ASD	Violent convictions in 7.3% of those w/ASD; risk factors for violent offending included older age, male gender, AS diagnosis, comorbid psychotic/substance abuse/personality disorders
Bronsard et al. (2010)[47]	Comparison of aggression rate between 74 intellectually disabled children & adolescents w/ASD & 115 typically developing controls in 3 observational situations (home, day care, during blood-drawing); ASD diagnoses made by direct clinical observation using DSM-IV[29] & ICD-10,[32] & confirmed with ADI-R[60]	Observer evaluations (parent, day-care provider, psychiatrist, nurse) using rating scale for aggression toward others	Intellectually disabled children & adolescents w/ASD; controls matched for age, gender, pubertal status	Yes	34%–58% of children w/ASD showed aggression toward others (highest aggression ratings made by day-care providers); aggression more common in children w/ASD (23%) compared to controls (0%) in blood-drawing situation

Continued on next page

Table 2

Continued

Study	Study type	Violence-detection method	Subjects	Comparison group w/o ASD?	Findings
Kanne & Mazurek (2011)[48]	Multisite, university-based study examining prevalence of, and risk factors for, aggression in children & adolescents w/ASD (n = 1380)	Individual item scores from ADI-R[60]	Child & adolescent outpatients w/ASD (autism, AS, PDD-NOS)	No, but examined risk factors for aggression among youth with ASD	Definite aggression (score of 2 or 3 on ADI-R[60] aggression items) in 35.4% of children/adolescents w/ASD; risk factors included younger age (6–11 y.o.), higher family income, parent-reported ASD-related social & communication problems, repetitive behaviors (specifically self-harming, ritualistic & resistance-to-change behaviors)
Cheely et al. (2012)[49]	Examination of ASD/DD database linked with juvenile justice/law-enforcement databases for prevalence of criminal offending among youth w/ASD (n = 609); ASD diagnoses confirmed by record review using DSM-IV[29]	Determination of subjects charged with a criminal offense based on linked autism & juvenile justice/law-enforcement databases	Youth w/ASD in South Carolina ASD/DD database; 12–18 y.o.; 1/3 intellectually disabled	No	5% (32/609) of youth w/ASD charged with criminal offenses; compared to matched comparison group of juvenile justice system–involved youth, those w/ASD had higher rates of crimes against persons, lower rates of probation violations & higher school-related offenses; however, no *general population* comparison group without ASD
Mayes et al. (2012)[50]	Examination of prevalence of explosive, oppositional & aggressive behavior in 435 children w/ASD compared to 988 children w/other clinical disorders & 186 typically developing children; diagnoses based on clinical evaluation using the following: DSM-IV;[29] parent interviews about early history; review of treatment, school & medical records; scores on CASD;[66] testing observations	Maternal ratings on behavioral scale	Children w/ASD, 6–16 y.o.; 302 w/high-functioning autism & IQ ≥ 80, 133 with low-functioning autism & IQ < 80	Yes	Aggression (based on maternal ratings) significantly more common in children w/ASD (16.6%) compared to typically developing children (0%), with no significant difference between low- & high-functioning ASD groups; however, children w/ASD may have been selected for disturbance (referred to psychiatric clinic, whereas typically developing children were not)

Continued on next page

Table 2

Continued

Study	Study type	Violence-detection method	Subjects	Comparison group w/o ASD?	Findings
Robinson et al. (2012)[51]	Screening of convicted prisoners (n = 2458) from all 12 prisons in Scotland for ASD with tool based on ASDI[58] & administered by prison officers	Subjects were convicted prisoners with mostly violent offenses	Male & female prisoners, young & old; mean IQ = 92.5	No	4% (97/2458) of prisoners scored above cutoff on screening tool for ASD; however, of the 97 who did, only 33 agreed to further assessment using standardized measures (AQ,[59] ASDI[58]), and of these, only 2 scored above cutoff for ASD on AQ;[59] none scored positive on ASDI;[58] due to poor sensitivity & interrater reliability of tool, unclear if ASD in these prisons underrepresented or underdetected
Mazurek et al. (2013)[52]	Examination of aggression prevalence in 1584 children & adolescents w/ASD enrolled in multisite ATN; ASD diagnoses confirmed by clinical interviews & ADOS;[62] aggression measured by single dichotomous (yes/no) item from parent in ATN survey	Single dichotomous item from parent survey	Children & adolescents w/ASD enrolled in ATN; range of intellectual functioning	No, but examined risk factors for aggression among youth with ASD	Aggression in 53.7% of individuals w/ASD; of these, self-injury, sleep problems, sensory difficulties were most strongly associated w/aggression
Keefer et al. (2014)[53]	Multisite, university-based study examining prevalence of aggression in 2648 children & adolescents w/ASD; diagnoses confirmed w/ADI-R[60] & ADOS[62]	Individual items from ADI-R[60] & CBCL[67]	Children & adolescents w/ASD; ages 4–17; range of intellectual functioning (mean IQ = 81.2)	No	Aggression in 35% of children & adolescents w/ASD; of these, small but significant relationship between repetitive behaviors & aggression
Hill et al. (2014)[54]	Examination of aggression prevalence in 400 children & adolescents w/ASD enrolled in Oregon ATN; diagnoses confirmed w/ADOS;[62] aggression measured using CBCL aggression scale[67]	CBCL aggression scale[67]	Children & adolescents w/ASD; ages 2–18; range of intellectual functioning	No, but examined risk factors for aggression among youth with ASD	Aggression in 25% of youth w/ASD; aggressive children w/ASD tended to have less severe overall & social affect symptoms, lower full-scale IQ, more sleep difficulties, internalizing problems & attention problems

Continued on next page

Table 2
Continued

Study	Study type	Violence-detection method	Subjects	Comparison group w/o ASD?	Findings
Sondenna et al. (2014)[55]	Screening of all forensic examination reports (n = 3382) filed in archives of Norwegian Board of Forensic Medicine over 10-year period for ASD using ICD-10[32] criteria	Subjects included offenders who had committed violent or sexual offenses & were referred for forensic psychiatric investigation	Forensic evaluees charged with, or convicted of, variety of offenses	No	ASD in 1.4% (44/3382) of evaluees; of these, 33/44 (69% of evaluees w/ASD) convicted of violent or sexual offenses; given that not all of 3382 evaluees who were charged w/violent offenses were convicted, prevalence of ASD among violent offenders likely above 1%

ADHD, attention-deficit/hyperactivity disorder; ADI-R, Autism Diagnostic Interview–Revised; ADOS, Autism Diagnostic Observation Schedule; AQ, Autism-Spectrum Quotient; AS, Asperger's syndrome; ASD, autism spectrum disorder; ASDI, Asperger's Syndrome Diagnostic Interview; ASD/DD, autism spectrum disorder—developmental disabilities; ATN, Autism Treatment Network; CASD, Checklist for Autism Spectrum Disorder; CBCL, Child Behavior Checklist; DSM-IV, *Diagnostic and Statistical Manual of Mental Disorders*, 4th ed.; ICD-10, International Statistical Classification of Diseases, 10th rev.; PDD-NOS, pervasive developmental disorder not otherwise specified; y.o., years old.

The first direct effort to determine the prevalence of violence in ASD was made by Ghaziuddin and colleagues,[38] who conducted an extensive, computer-based search of all published articles on the clinical features of AS from 1944 to 1990. Of a total sample of 132 patients, up to 5.6% were identified as having a history of violent behavior, comparable to the age-matched rates of violent crime in the general population. They concluded that there was no association between violence and AS.

Scragg and Shah[39] raised the possibility that Ghaziuddin and colleagues'[38] prevalence estimates for violence in AS may be inaccurate due to underdetection of this diagnosis in prisons and secure settings. They screened the male population (n = 392) of a maximum security hospital in England for evidence of autistic-type behaviors. Those positive on the initial record-based screen moved on to a second stage consisting of a semistructured interview with the key nurses (those most directly involved in the care of the patient) for those patients. In the third stage, patients were interviewed by an investigator. The authors found an AS prevalence (using Gillberg and Gillberg criteria)[33] of up to 2.3%. They noted that this rate was much higher than the general population rate of 0.36% cited by Ehlers and Gillberg.[56] Of note, this latter estimate of community AS prevalence is significantly lower than the recent Centers for Disease Control and Prevention estimate[34] of 1.47% of eight-year-olds in the United States having ASD—which suggests that the ASD rate in forensic inpatients may not differ significantly (or at least as dramatically) from that in the general population.

Expanding on Scragg and Shah's efforts,[39] Hare and colleagues[40] examined the prevalence of ASD in 1305 patients residing in three secure hospitals in England (including the subjects from Scragg & Shah's study).[39] Those scoring above cutoff on an ASD screening questionnaire had their records reviewed for clinical information, including impairments in social interaction, communication, repetitive/stereotyped activities, and special interests. Criteria for diagnosing ASD were equivalent to ICD-10 criteria.[32] The authors found an ASD prevalence of up to 5.3%. Two-thirds of the ASD group met criteria for AS. Interestingly, those in the ASD group were significantly more likely to have a neurological condition (15/31), including brain pathology (8/15, comprising right hemisphere damage, right temporal lobe atrophy, prefrontal pathology, and unspecified hypoxic brain damage), epilepsy (3/15), chromosomal disorders (2/15), and past meningitis (2/15). The authors therefore suggested that the presence of neuropathology may increase the likelihood of offending in individuals with ASD.

A high forensic-setting rate of ASD was also found by Siponmaa and colleagues,[41] who retrospectively examined the prevalence of child neuropsychiatric disorders in 126 offenders (aged 15 to 22 years) referred for forensic, presentencing psychiatric investigation over a five-year period in Stockholm. These investigations included evaluations by a psychologist, social worker, and psychiatrist. The resulting data sheets included information such as demographic data, early psychomotor development, child neuropsychiatric symptoms/signs over time, early traumatic experiences, substance abuse, past and current criminality, impulsivity, and empathy. Based on DSM-IV,[29] the authors found an ASD prevalence of 15%, with AS of 3%.

Soderstrom and colleagues[42] discovered similar forensic-setting prevalence rates of ASD. They examined 100 adults (aged 17 to 76) consecutively admitted by court order to a

forensic psychiatric institution, all of whom were under prosecution for severe violent or sexual crimes. DSM-IV[29] diagnoses were assigned to all subjects using the Structured Clinical Interview for DSM-IV Axis I Disorders,[57] Asperger's Syndrome Diagnostic Interview,[58] and DSM-IV criteria for disorders not covered by the Structured Clinical Interview.[57] They found an ASD prevalence of 18% (autism, 5%; AS, 3%; and atypical autism, 10%).

Prison populations were examined by Robinson and colleagues,[51] who assessed 2458 prisoners for the presence of ASD using a screening tool completed by prison officers. Ninety-seven of 2458 prisoners (4%) scored above the cutoff on the tool; however, when 32 of these prisoners were further assessed with standardized measures (the other 65 declined to be interviewed), including the Autism Quotient[59] and Asperger's Syndrome Diagnostic Interview,[58] only 2/32 (6.25%) scored above the cutoff on the former,[59] and none scored positive on the latter.[58] The authors noted that the very low rate of ASD detected in their study could reflect the inadequate sensitivity of the screening tool, selection bias (with persons with ASD declining to be interviewed), or a low rate of ASD in the prison population, possibly due to diversion into mental health settings.

Sondenaa and colleagues[55] screened all forensic examination reports (n = 3382) filed in the Norwegian Board of Forensic Medicine archives between 2001 and 2011 and found a diagnosis of ASD (based on ICD-10 criteria)[32] in 1% of the sample. Considering that a portion of the forensically examined individuals had *not* committed violent or sexual offenses, the ASD prevalence among violent/sexual offenders was therefore somewhere above 1%.

While the above prevalence studies indicate that ASD is generally overrepresented in forensic settings—which suggests diagnostic underdetection and the possibility that individuals with ASD might be more prone to violence—sample-selection issues must be considered (e.g., forensic psychiatry samples often produce higher rates of ASD, as these subjects are likely to have mental health needs of some kind).

To that end, Woodbury-Smith and colleagues[43] examined the prevalence of offending among men and women with ASD (AS/high-functioning autism) living in the community. Inclusion criteria included meeting ICD-10 diagnostic criteria for an ASD[32] (confirmed with the Autism Diagnostic Interview–Revised [ADI-R])[60] and having a full-scale IQ of 70 or above on the Wechsler Abbreviated Scale of Intelligence.[61] Twenty-five adults with ASD were compared to 20 adult volunteers without ASD recruited from a local large company. Subjects completed a self-report questionnaire regarding behaviors that could lead to arrest by the police, prosecution, and conviction. Information was also obtained on convictions within the ASD group from the Home Office Offenders' Index (UK). Thirty percent of the ASD group reported a history of violent behavior, similar to the comparison group (25%). However, "violent behavior" was unclearly defined (the authors noted that their self-report measure was too biased toward detecting minor illegal behaviors), and the sample sizes were small.

Mouridsen and colleagues[45] used Danish register data to compare 313 adults (aged 25 to 59 at follow-up) with ASD to 933 general population controls matched for age, gender, place of birth, and social group in terms of conviction rates. Rates of violence (combining "violent crimes," "sexual offending," and "arson" as categorized separately by the authors) were 0.88% for the infantile autism group, 4.6% for the atypical autism group (compared to 2.8% of controls), and 7.6% for the AS group (compared to 3.2% of controls). Differences in violent crime rates between the ASD and control groups were statistically significant only for arson; specifically, individuals with AS were significantly more likely than control individuals to have committed arson ($p < 0.0009$). Among all individuals with ASD, 5.1% were convicted of violent crimes over the course of the approximately 30-year review period. The authors acknowledged that older diagnostic criteria (ICD-9) were used in making initial ASD diagnoses.

Langstrom and colleagues[46] also used longitudinal registers to examine 422 individuals (aged 15 and older) with ASD (diagnosed primarily using ICD-10 criteria)[32] hospitalized between 1988 and 2000, and compared those committing violent offenses with those who did not on a number of variables. They found that 7.3% of individuals with ASD were convicted of violent offenses. They noted that risk factors for violent offending included older age, male gender, a diagnosis of AS (as opposed to autistic disorder), and comorbid psychotic, substance use, and personality disorders. They commented that violent individuals with ASD had the same sociodemographic and comorbidity features as violent persons without ASD. Among those with comorbid disorders, violence occurred in 18% of those with schizophrenia, 33% of those with personality disorders, and 71% of those with substance use problems. While their study employed a much larger sample than that of Woodbury-Smith and colleagues[43] and was one of the first to examine violence-risk factors among individuals with ASD, subjects were selected based on being hospitalized and therefore may not be representative of individuals with ASD living in the community. Moreover, like the study of Mouridsen and colleagues,[45] violence was measured via conviction rates, which may have produced underestimates.

Allen and colleagues[44] used subject and informant surveys to examine 126 adults with ASD (AS, confirmed using the Asperger's Syndrome Diagnostic Interview)[58] from a large geographical area of South Wales and found offending behavior (over 80% violent) in 26%. Like Langstrom and colleagues,[46] the authors noted that comorbid psychiatric disorders were common, including schizophrenia (25%), depression (12.5%), and attention-deficit disorder (18.75%).

Subsequent prevalence studies have focused on younger populations with ASD. For example, Bronsard and colleagues[47] compared 74 intellectually disabled youth with ASD to 115

typically developing controls in terms of aggression toward others in three observational situations. ASD diagnoses were based on DSM-IV[29] and ICD-10[32] criteria and confirmed with the ADI-R.[60] Based on parent and day-care provider evaluations, respectively, 34% and 58% of children with ASD displayed aggression toward others. Individuals with ASD were also more aggressive (23% vs. 0%) during a blood-drawing situation, which the authors interpreted as suggesting poorer coping skills when faced with stress in persons with ASD.

Kanne and Mazurek[48] studied the prevalence of, and risk factors for, aggression in 1380 children and adolescents with ASD in a multisite, university-based study. Core ASD symptoms were assessed using the ADI-R,[60] Autism Diagnostic Observation Schedule (ADOS),[62] Social Responsiveness Scale,[63] and Repetitive Behavior Scale–Revised.[64] "Aggression" was assessed based on individual item scores from the ADI-R.[60] They found that 35.4% of subjects with ASD demonstrated definite aggression toward others. They also found that aggression was associated with younger age (highest in the under 6, 6–8, and 9–11 age groups), higher family income, parent-reported social and communication problems (as measured by the Social Responsiveness Scale),[63] and repetitive (including self-injurious, ritualistic, and resistance-to-change) behaviors. They noted that these findings are consistent with work by Reese and colleagues,[65] who found that autistic children, compared to non-autistic peers, displayed disruptive behavior to escape demands that impeded performance of a repetitive behavior, to maintain access to items used in a routine, or to avoid sensory stimuli. They posited that caregiver attempts to discourage certain repetitive behaviors could trigger reactive aggression from individuals with ASD, accounting for the association between repetitive behaviors and aggression. Case reports by White and colleagues[24] support this possibility.

Mayes and colleagues[50] compared 435 children with ASD (aged 6 to 16, with a range of intellectual functioning) to 186 typically developing children in terms of aggression rates. ASD diagnoses were based on DSM-IV[29] criteria, using the following: parent interviews about early history and current symptoms; reviews of treatment, school, and medical records; scores on the Checklist for Autism Spectrum Disorder;[66] and observations of the child during psychological testing. Aggression (as determined by maternal ratings) occurred in 16.6% of children with ASD compared to 0% of typically developing children, with no significant difference between the low-functioning and high-functioning ASD groups. However, those with ASD had been referred to a psychiatry clinic and thus may have been selected for disturbance.

Cheely and colleagues[49] examined data from linked autism and juvenile justice/law enforcement databases and found that of 609 youth (aged 12 to 18) with ASD (about one-third of whom had intellectual disability), 5% were charged with criminal offenses. Compared to a matched comparison group of juvenile justice system–involved youth, those with ASD had higher rates of crimes against persons, lower rates of probation violations, and higher rates of school-related offenses. The authors speculated that individuals with ASD may be more likely to lash out violently during an altercation, less likely to violate probation due to increased rule adherence, and more likely to deal problematically with the social demands of a school setting.

Mazurek and colleagues[52] expanded the scope of the 2011 Kanne and Mazurek study[48] by looking at 1584 children and adolescents enrolled in a network of autism treatment centers across Canada and the United States. The authors verified ASD diagnoses with clinical interviews and the ADOS,[62] and measured aggression with a single dichotomous ("Yes" or "No") item from a parent survey. They found current physical aggression in 53.7% of subjects, most strongly associated with self-injury, sleep problems, and sensory difficulties. However, the measure of aggression used (parent report on a single dichotomous item) may have inflated the reported rate.

Keefer and colleagues[53] noted an aggression rate of 35% among 2648 children and adolescents with ASD who were part of a multisite, university-based sample. The subjects had a range of intellectual functioning. Diagnoses were confirmed with the ADI-R[60] and ADOS.[62] They noted a significant, but small, relationship between restricted/repetitive behaviors and aggression, with larger effect sizes observed when using teacher report.

Finally, Hill and colleagues[54] looked at 400 children (aged 2 to 18) enrolled in a multisite treatment network with a diagnosis of ASD supported by administration of the ADOS.[62] They found an aggression prevalence (using the Child Behavior Checklist[67] Aggressive Behavior scale) of 25%, with aggressive children tending to have less severe overall and social-affect ASD symptoms, lower full-scale IQ scores, and more sleep difficulties, internalizing problems (including anxiety), and attention problems compared to non-aggressive children with ASD.

In summary, prevalence studies have aimed to more quantitatively evaluate the association between ASD and violence. One of these, based on a review of all published case reports, found no significant association between ASD and violence.[38] Another four studies found an overrepresentation of ASD in forensic settings, with prevalence rates ranging from 1.5% to 18%.[39–42] Community-based studies have reported violence rates of 5.1% to 58% among individuals with ASD.[43–50,52–54] Given the potential selection biases inherent in forensic prevalence studies and the lack of significant difference from (or the absence of) normal population comparison groups in most community-based prevalence studies, these reports have not conclusively shown individuals with ASD to be more violent than individuals without ASD, with the possible exception of such persons having a higher risk of committing arson (based on one prevalence study).[45] Several risk factors for violence in persons with ASD were identified[40,44,46,48,49,52–54] and will be discussed later in this review.

Table 3

Previous Reviews on Relationship Between Violence and Autism Spectrum Disorder

Author	Findings	Theoretical explanation for violence in autism spectrum disorder
Silva et al. (2004)[68]	Based on overrepresentation of ASD in forensic settings, ASD pathology is a risk factor for criminal behavior; ASD may be implicated in the development of some serial killers	Theory-of-mind deficits, weak central coherence, history of neglect may contribute to development of serial-killing behavior in some individuals with ASD Weak central coherence may allow some serial killers to separate homicidal behavior from other aspects of their lives History of neglect may allow formation of closed psychological infrastructures in which maladaptive fantasies can thrive, unhindered by parental feedback
Newman & Ghaziuddin (2008)[69]	Unclear if violence more prevalent in AS compared to general population, but 29.7% of violent individuals w/AS had evidence of definite psychiatric disorder, & 54% had evidence of probable psychiatric disorder	Comorbid psychiatric disorders raise risk of violent offending among individuals with AS
Bjorkly (2009)[70]	No empirical evidence to support or refute possible link between AS & violence Among violent persons w/AS, motives included misinterpretation of others' intentions in 35%, sensory hypersensitivity in 21%, sexual frustration & empathic failure to respect others' integrity in 10%, & others' disruptions of AS preoccupations in 7%	Violence in AS may be driven by deficiency in emotional empathy (ability to feel compassion for, or be emotionally involved with, victim) & impairment in social interaction (including misinterpretation, coping failure, hypersensitivity to sensory stimuli)
Cashin & Newman (2009)[71]	Significant proportion of ASD among individuals in custody undetected/misdiagnosed ASD symptoms such as obsessive-compulsive features or impaired social skills increases vulnerability to bullying, exploitation, social isolation Limited research on experience of individuals w/ASD in prisons	"Real triad of impairment" in ASD consists of impaired theory of mind, impaired abstraction & visual—as opposed to linguistic—processing, leading both to inability to form unified, centrally coherent base of knowledge about the world, & to deficient empathy
Browning & Caufield (2011)[72]	Overrepresentation of individuals with ASD in criminal justice system could reflect social circumstances, comorbid mental health issues, inadequate recognition/understanding of ASD by criminal justice agencies, impaired ability of persons w/ASD to escape detection Community studies have shown no significant association between ASD & offending	Theory-of-mind deficits or intense preoccupation with narrow interests are predominant factors behind offending in individuals w/ASD
Gunasekaran & Chaplin (2012)[73]	No increased risk of offending in people with ASD compared to those without ASD Lower-functioning subgroups w/ASD may have lower prevalence of offending than general population Higher-functioning ASD subgroups (AS, atypical autism) more likely than lower-functioning ASD subgroups to engage in arson, sexual offending & stalking	Comorbid psychiatric disorders (including psychotic, personality, substance abuse) & lack of empathy/ability to recognize fear may increase violence risk among individuals w/ASD
Lerner et al. (2012)[74]	No increased risk of violent criminal activity among individuals with high-functioning ASD, but possibly "some extant relationship that should be considered"	Violence in individuals with high-functioning ASD due to deficits in (1) theory-of-mind abilities, (2) emotion regulation & (3) internal moral reasoning
Mouridsen (2012)[75]	No increased risk of offending in people with ASD compared to those without ASD	Comorbid psychiatric disorders (including psychotic & personality disorders) & impaired ability to recognize fear in others may raise risk of offending in ASD

Continued on next page

Table 3

Continued

Author	Findings	Theoretical explanation for violence in autism spectrum disorder
King & Murphy (2014)[76]	Although ASD appears overrepresented in offender populations, 5 of 7 prevalence studies looking at ASD in offender populations used biased samples; the other 2 studies (which did not use biased samples) employed poor diagnostic methods for ASD Equal or lower rates of offending among those with ASD compared to those without ASD Although trend toward higher comorbid psychotic & personality disorders among those w/ASD who offend, studies reviewed were of people in mental health settings (i.e., selection bias)	Mood disturbances, social deficits & poor emotional coping skills significant factors in offending behavior among individuals w/ASD
Matson & Adams (2014)[77]	Aggression "very frequent," occurring in over half of individuals w/ASD (based on findings of Mazurek et al.)[52]	Poor emotion regulation, social/communicative deficits, searching for tangible items & wish to escape from undesired tasks/environments all contribute to aggression in individuals w/ASD

AS, Asperger's syndrome; ASD, autism spectrum disorder.

In examining the relationship between ASD and violence, a third source of information can be found in previous reviews on this topic, many of which conclude by proposing explanations for violent behavior in ASD.

Reviews with Proposed Explanations for Violence in ASD

Table 3 summarizes previous reviews that have been published on the association between ASD and violence. Ten such reviews were found.

Newman and Ghaziuddin[69] reviewed all published articles reporting an association of AS with violence. Of 37 cases that met inclusion criteria, 31 (83.7%) had evidence of a definite or probable psychiatric disorder, including attention-deficit/hyperactivity disorder, depression and other mood disorders, "obsessional neurosis," and disorders resulting in maximum-security hospitalization. They concluded that most violent individuals with AS suffer from comorbid psychiatric disorders that raise their risk of offending, as they do in the general population.

Bjorkly[70] also reviewed the literature and found that of 29 violent ASD-related incidents, 35% were driven by social misinterpretations of others' intentions, 21% by sensory hypersensitivity, 10% by a combination of sexual frustration and empathic failure to respect others' integrity, and 7% by others' disruptions of AS-related preoccupations. He concluded that no empirical evidence either supported or refuted a link between AS and violence, and that AS-related violence may be driven by empathy deficiency (specifically an impaired ability to feel compassion for, or be emotionally involved with regard to, the victim) and impairment in social interaction.

Cashin and Newman,[71] in reviewing the relationship between autism and criminality, also noted deficient empathy as a factor in ASD-related violence but, in contrast to Bjorkly's emphasis on its emotional aspects,[70] saw such empathy deficiency as the result of core cognitive-processing deficits. They described a "real triad of impairment" in ASD consisting of impaired abstraction, impaired theory of mind, and visual, as opposed to linguistic, processing, which results in an inability to form a centrally coherent base of knowledge about the world and in a marked deficit in empathy.

In line with Cashin and Newman's hypotheses,[71] Silva and colleagues[68] reviewed the literature on ASD and violence and inferred that theory-of-mind deficits, weak central coherence, and a history of neglect may contribute to the development of serial-killing behavior in some individuals with ASD. They proposed that weak central coherence may allow serial killers with ASD to compartmentalize their life experiences by separating their homicidal behavior from other important aspects of their lives, and that a history of neglect may allow future serial killers with ASD to harbor maladaptive fantasies unhindered by parental feedback.

Browning and Caufield[72] also linked offending behavior in ASD to theory-of-mind deficits. They added that while individuals with ASD appear to be overrepresented in the criminal justice system, the overrepresentation could reflect social circumstances, comorbid mental health issues, and impaired ability to escape detection.

Theory-of-mind deficits were likewise cited as one component in ASD-related violence by Lerner and colleagues.[74] These authors proposed that a triad of deficits in (1) theory-of-mind abilities, (2) emotion regulation, and (3) internal moral reasoning may explain how violent criminal behavior may emerge in individuals with high-functioning ASD under conditions of conflict or ambiguity. They noted that moral reasoning in these individuals may represent a "hacked-out"

process whereby such persons are able to respond to previously learned morally relevant scenarios but are unable to make such distinctions in new and unfamiliar situations. Regarding the second domain, emotion regulation was also cited by Matson and Adams[77] as a contributory factor in ASD-related violence.

Mouridsen[75] and Gunasekaran and Chaplin[73] both concluded that people with ASD do not appear more likely to offend than people without ASD, but that among individuals with ASD, comorbid psychiatric diagnoses (including psychotic and personality disorders) and an impaired ability to recognize fear in others may raise the risk of offending. Gunasekaran and Chaplin[73] added that higher-functioning ASD subgroups (e.g., AS and atypical autism) are more likely to engage in arson, sexual offending, and stalking compared to lower-functioning ASD subgroups, in whom criminal damage is more common.

Finally, King and Murphy[76] noted that among offender populations, ASD appears to be overrepresented but that most studies of these populations have used biased samples selected for psychopathology. They also noted that well-controlled studies showed that people with ASD were equally or less likely to offend than people without ASD. They commented that despite a trend toward higher rates of psychosis and personality disorder in individuals with ASD who offend, the studies they reviewed were all conducted in mental health settings, which are likely to include people with multiple diagnoses. They added that—based on input from individuals with ASD in the criminal justice system—social-functioning deficits, mood disturbances, and poor emotional-coping skills were significant factors in offending behavior.

In summary, ten previous reviews on the relationship between ASD and violence indicate that individuals with ASD are no more violent than those without ASD. The authors of those reviews have collectively posited three main factors that may underlie violent behavior in persons with ASD: (1) comorbid psychopathology, (2) deficits in social cognition (to include impairments in theory-of-mind abilities and empathy), and (3) emotion-regulation problems.

DISCUSSION

This review has attempted to provide an update on the literature regarding the association between violence and ASD, taking into account information from descriptive case reports, prevalence studies, and previous reviews.

Case reports have described individuals with ASD committing a range of violent acts. Many have posited features of ASD that could increase the likelihood of such acts, including the following: impaired theory-of-mind abilities; difficulty appropriately perceiving nonverbal cues; intense, restricted interests; and comorbid psychiatric disorders.

Regarding prevalence studies, those conducted in forensic settings generally found an overrepresentation of ASD, but selection biases undercut any conclusions that this overrepresentation reflects greater violence among individuals with ASD. Community studies reported a wide range of violence rates (5% to 58%) among individuals with ASD, reflecting variations in violence-detection methods and populations studied. Many of these studies (six out of ten) did not include comparison groups of individuals without ASD, and of the four that did, two[43,45] showed no significant difference in violence rates between those with and without ASD (with the possible exception of arson in one study).[45] The remaining two studies reported greater violence in persons with ASD compared to controls, but one[50] had sampling biases and the other[47] used informants (day-care providers) who may have had different tolerance levels for aggression, and used an intrusive, anxiety-provoking situation to measure aggression in a severely impaired ASD sample. Therefore, on the whole, prevalence studies have provided no persuasive evidence that individuals with ASD are more violent than those without ASD. The issue of arson deserves further exploration, as one prevalence study suggested a higher risk of arson among individuals with AS,[45] and case reports have described such behavior in AS.[5,12,18,22]

Ten previous reviews indicate that individuals with ASD are no more violent than those without ASD. The authors of those reviews have overall posited three main explanatory (or generative) factors that may underlie violent behavior in persons with ASD: (1) comorbid psychopathology, (2) deficits in social cognition (to include impairments in theory-of-mind abilities and empathy); and (3) emotion-regulation problems. These factors have gained preliminary empirical support.[78–80]

Turning from the question of whether individuals with ASD are more violent than those without ASD, the issue of which individuals among those with ASD are at greater risk for violence was examined in nine studies.[40,44,46,48,49,52–54,70] Risk factors identified in these studies include younger age (6–11 years old),[48] older age (26 and older),[46] male gender,[46] having a diagnosis of AS,[46] higher parental income,[48] parent-reported social and communication problems (as measured by the Social Responsiveness Scale[63]),[48] less severe overall and social affect symptoms (as measured by the ADOS[62]),[54] repetitive behaviors,[48,54] sensory difficulties,[54,70] comorbid psychiatric disorders (including psychotic, personality, and substance use disorders),[44,46] comorbid neuropathology,[40] and sleep difficulties.[52,54]

Regarding some of these risk factors, older age was noted by Langstrom and colleagues[46] to be likely related to the cross-sectional nature of their study and the greater likelihood of an individual appearing in cumulative crime registers over time. The higher risk in individuals with AS compared to those with other forms of ASD is likely due to relatively intact intellectual capacity and ability to communicate (albeit inappropriately) in the former, along with tighter supervision of the latter. Higher parental income lacks an obvious explanation as a risk factor, though Kanne and Mazurek[48] speculated that higher-income families may have more access to

interventions that challenge (and frustrate) children with ASD, possibly precipitating more aggression. Higher parent-reported social and communication deficits (as measured by the Social Responsiveness Scale)[63] as a risk factor makes intuitive sense, as such difficulties would seem to predict problematic behaviors. The disparity between this finding and the observation that *less* severe overall and social-affect ASD symptoms, as measured by the ADOS,[62] increased violence risk[54] requires explanation; it may be that the Social Responsiveness Scale reflects broader ASD-related functioning that is better captured by parent report, whereas the ADOS focuses on core symptoms specific to an ASD diagnosis, as noted by Kanne and Mazurek.[48] Comorbid neurological disorders could cause disruption of brain circuits (e.g., prefrontal, limbic) involved in the control of aggression, increasing violence risk. Sleep difficulties as a risk factor could be related to comorbid psychopathology or to fatigue-based exacerbation of impaired emotion regulation in ASD.

An interesting question concerns the extent to which risk factors for violence in the general population are relevant to individuals with ASD. In typically developing individuals, risk factors for violence include male gender, younger age, lower intellectual functioning, early language delays, low family income, low parent education levels, maternal antisocial behavior, early maternal onset of childbearing, poor school performance, delinquent peers, living in a disadvantaged neighborhood, and comorbid psychiatric disorders and substance abuse.[54,69,81] Based on the results of this review, it appears that some of these risk factors apply to individuals with ASD (e.g., male gender, younger age, comorbid psychiatric disorders, and substance abuse), some do not (early language delays, low family income), and some have an unclear impact at present (lower intellectual functioning, maternal antisocial behavior/early onset of childbearing, peer and neighborhood factors).

How can these explanatory and associational risk factors help us in terms of preventing violence among individuals with ASD?

IMPLICATIONS FOR TREATMENT AND PREVENTION OF VIOLENCE IN PERSONS WITH ASD

If we presume the above-noted explanatory factors contribute to violence in individuals with ASD, it is worth exploring how such deficits may be treated in order to minimize violence risk. Possible treatment approaches are discussed below.

Comorbid Psychopathology

As noted, many individuals with ASD who commit violent acts have been shown to have comorbid psychiatric disorders.[4,15,69] Careful assessment and treatment of these disorders based on current standards of practice (e.g., APA practice guidelines) are crucial in helping to mitigate the increased violence risk that these illnesses confer on individuals with ASD.

Social-Cognition Deficits

Baez and colleagues[82] found that adults with AS showed significant impairments compared to matched healthy controls on tasks measuring theory of mind, empathy, emotion recognition, and self-monitoring in social settings. By contrast, adults with AS performed as well as controls on tasks in which situational elements were clearly defined (including a moral judgment task in which information about intention, outcome, and context was explicitly presented). Based on their findings, Baez and colleagues recommended (1) traditional social-skills training programs[83] that incorporate naturalistic environments to enhance skill application and that aim at teaching explicit rules to help individuals with ASD build relationships with others, and (2) programs that also teach implicit rules for interpreting unpredictable social contexts.

One promising intervention for individuals with ASD that takes into account the need to assess contextual cues was examined by Stichter and colleagues,[84] who developed a group-based Social Competence Intervention, based on cognitive-behavioral principles, to target deficits in theory of mind, emotion recognition, and executive function in 27 students aged 11 to 14 with ASD (AS/high-functioning autism). The curriculum included skill instruction, modeling, and practice in structured and naturalistic settings. Topics included facial-expression recognition, sharing ideas with others, turn taking in conversations, recognizing feelings/emotions of self and others, and problem solving. All students showed significant improvement on parent-reported social skills and executive functioning. Significant growth was demonstrated on direct assessments of theory of mind, facial-expression recognition, and problem solving.

Stichter and colleagues[85] subsequently adapted the Social Competence Intervention to meet the needs of elementary school students. Using a similar format and curriculum in 20 students aged 6 to 10 with AS/high-functioning autism, they found significant improvements on parent-perceived overall social abilities and executive functioning, and on direct assessments measuring theory of mind and problem solving.

Other researchers (e.g., Donoghue et al.)[86] have also noted the potential efficacy of cognitive-behavioral therapy in treating youth with AS.

Emotion-Regulation Problems

Samson and colleagues[87] found that on measures of emotional functioning, 27 individuals with ASD (AS/high-functioning autism) reported higher levels of negative emotion, greater difficulty identifying and describing their emotions, less use of cognitive reappraisal, and more use of emotional suppression (a less adaptive emotion-regulation strategy) compared to controls. The authors suggested that affective functioning in individuals with ASD could be improved by the use of techniques that enhance their ability to attend to and discriminate emotions and by strategies that increase their ability to respond flexibly to emotions by encouraging cognitive reappraisal. They noted promising research in ASD that has been conducted to

address stress management,[88] anger management,[89] and emotion regulation, including the use of cognitive-linguistic strategies[90] and "thinking tools."[91]

Kaartinen and colleagues[92] similarly noted problems with emotion regulation resulting in more severe reactive aggression in boys with ASD compared to boys without ASD in response to minor aggressive attacks, concluding that behavioral and cognitive interventions were important to help these boys learn more assertive, rather than aggressive, responses to conflict.

In line with the findings and recommendations of Samson,[87] Kaartinen,[92] and their colleagues, various researchers[93–96] have explored the utility of dialectical behavior therapy in individuals with intellectual disabilities, some of whom were diagnosed with ASD. This research has looked at various populations, including aggressive, intellectually disabled adults living in supervised residential settings[94] and adult offenders.[95,96] These reports provide preliminary promise for dialectical behavior therapy in helping to foster effective emotion-regulation strategies in individuals with ASD. Mindfulness strategies have also been reported to help individuals with ASD effectively manage negative emotions that trigger aggression.[97]

Biologically based interventions have been explored to treat the emotion-regulation (and social-cognitive) deficits associated with ASD. Thompson and colleagues[98] reported significant EEG differences between individuals with AS and controls in the frontal, temporal, and temporal-parietal (mirror neuron) areas of the brain, with abnormal activity originating from the anterior cingulate, amygdala, uncus, insula, hippocampal gyrus, parahippocampal gyrus, fusiform gyrus, and orbitofrontal or ventromedial areas of the prefrontal cortex. In a second report, given that the functions of these brain areas correspond to deficits seen in AS, Thompson and colleagues[99] suggested using neurofeedback training to target symptoms such as difficulty reading and mirroring emotions, poor self-regulation skills, anxiety, and inattentiveness. Based on data from neurofeedback training in 150 clients with AS seen over a 15-year period, the authors found significant improvements on measures of core AS symptoms, including difficulties with social functioning and anxiety.

Biological interventions have also included pharmacologic approaches. For example, the second-generation antipsychotics risperidone[100,101] and aripiprazole[102] have shown efficacy in treating aggression and irritability in children and adults with ASD, and selective serotonin reuptake inhibitors (e.g., fluoxetine) have shown benefit for ritualistic/repetitive behaviors in adults with ASD.[103] Informative reviews on ASD-related medication treatments have been published.[104,105]

PRACTICAL APPLICATION

How should a clinician assess an individual with ASD in terms of his or her risk for violence and the possible need to intervene to mitigate that risk? In addition to the risk assessment included in a standard psychiatric evaluation, the factors discussed earlier warrant consideration. Take the following hypothetical example:

> A 14-year-old boy diagnosed in the past with AS is sent home from school after yelling at his mathematics teacher and leaving drawings of buildings being blown up on the teacher's desk. General clinical assessment reveals a history of depression. The boy was suspended from school last year after hitting a peer (whom he claims intentionally bumped him playing soccer). He denies current suicidal or homicidal ideation but expresses anger that his math teacher "completely misrepresented the concepts" during class. He admits to drawing the pictures in question, stating he has always been fascinated with "disintegration." His father (a software designer) and mother (a radiologist) note the boy's long history of difficulty making and maintaining friends, oversensitivity to noise, and repetitive hand-twirling.

This boy's associational risk factors for ASD-related violence include his male gender, young age, AS diagnosis, high parental income, parent-reported social-interaction difficulties, history of sensory abnormalities, and repetitive behaviors. Based on these factors, an examination of generative factors shows that he has a comorbid psychiatric disorder (depression). Assessment of additional generative factors could entail psychometric testing to assess the domains of theory of mind, empathy, and emotion regulation. If deficits are revealed, his generative risk factors for violence could be addressed via psychotherapeutic or pharmacologic intervention for his depression, Social Competence Intervention (or other cognitive-behavioral therapy–based approach) for his social cognitive deficits, and possible dialectical behavior therapy for problems with emotion regulation.

FUTURE RESEARCH

To ascertain whether individuals with ASD are more violent than those without ASD and whether the proposed generative factors increase their violence risk, a future study should undertake a prospective, community-based comparison of two groups: individuals with ASD and those without ASD, matched for age, gender, education level, socioeconomic status, and presence of comorbid psychiatric and neurological disorders. Clarity in the diagnostic criteria used for ASD, the makeup of the ASD sample (proportion of subjects with DSM-IV autistic disorder, Asperger's disorder, etc.), and the definition of violence would be important. Within the ASD group, baseline and follow-up psychometric testing to assess the realms of social cognition and emotion regulation should be performed. Violent incidents could be tracked via informant/self-report and legal records. It could then be examined whether more violent incidents were reported over time in the ASD than in the comparison group, and within the ASD group, whether violent individuals were more likely to evidence

deficits in social cognition and emotion regulation than nonviolent individuals.

Such a study would also have potential forensic implications. An expert may have difficulty stating the empirical basis for his or her conclusion that ASD-related deficits were instrumental in driving a defendant's violent behavior. If future research confirms the relevance of the above-noted generative factors in increasing ASD-related violence risk, such information could be referenced in solidifying empirically supported explanations for violence in defendants with ASD.

LIMITATIONS

This review has a number of limitations. First, methodological differences among the prevalence studies cited—including differences in how "violence" was defined and measured, "type" of ASD examined (e.g., autism, AS), subject source, inclusion of non-ASD comparison groups, sample sizes, and method for diagnosing ASD—limit the ability to draw firm conclusions about violence risk factors in ASD or violence risk relative to the general population. Regarding the ASD diagnostic method, four of the prevalence studies[39,40,44,55] did not clearly incorporate robustly gathered developmental information into their assessments (via parent/relative interview regarding early development, review of childhood school/clinical records, or use of the Autism Diagnostic Interview–Revised[60]), which is a significant limitation of those studies. Second, other potential generative risk factors for ASD-related violence (e.g., a history of psychological trauma)[106] were not emphasized, as the aim was to identify proposed risk factors based on multiple published reports. Such factors may be equally relevant but have simply not received adequate scientific attention to date. Third, while this review has focused on the relationship between ASD and violence, most of the case reports involved individuals with AS, as did a number of the prevalence studies. Moreover, in two of the community prevalence studies, violent behavior was significantly more prevalent among individuals with AS than among those with other forms of ASD.[45,46] It could be that the above risk factors are mainly applicable to individuals with AS and only partially relevant to other individuals with ASD, consistent with Tsai's[107] assertion that autistic disorder and AS are two distinct disorders.

CONCLUSION

This review has attempted to provide a comprehensive update on the literature addressing the relationship between ASD and violence. Findings from descriptive case reports, prevalence studies, and previous reviews suggest that, while no conclusive evidence indicates that individuals with ASD are more violent than those without ASD, specific generative and associational risk factors may increase violence risk among individuals with ASD. Further research would help to confirm these findings, suggest potential directions for evaluation, treatment and prevention, and potentially provide compelling empirical support for forensic testimony regarding defendants with ASD charged with violent crimes.

Declaration of interest: The author reports no conflicts of interest. The author alone is responsible for the content and writing of the article.

The author thanks Luke Tsai, MD, for his input on this manuscript.

REFERENCES

1. Asperger H, Frith U, trans. Autistic psychopathy in childhood. [1944]. In: Frith U, ed. Autism and Asperger syndrome. Cambridge: Cambridge University Press, 1991.
2. Mawson D, Grounds A, Tantam D. Violence and Asperger's syndrome: a case study. Br J Psychiatry 1985;147:566–9.
3. Baron-Cohen S. An assessment of violence in a young man with Asperger's syndrome. J Child Psychol Psychiatry 1988;29:351–60.
4. Tantum D. Lifelong eccentricity and social isolation I: psychiatric, social, and forensic aspects. Br J Psychiatry 1988;153:777–82.
5. Everall IP, Lecouteur A. Firesetting in an adolescent boy with Asperger's syndrome. Br J Psychiatry 1990;157:284–7.
6. Chesterman P, Rutter SC. Case report: Asperger's syndrome and sexual offending. J Forensic Psychiatry 1993;4:555–62.
7. Cooper SA, Mohamed WN, Collacott RA. Possible Asperger's syndrome in a mentally handicapped transvestite offender. J Intellect Disabil Res 1993;37:189–94.
8. Kohn Y, Fahum T, Ratzoni G, Apter A. Aggression and sexual offense in Asperger's syndrome. Isr J Psychiatry Relat Sci 1998;35:293–9.
9. Bankier B, Lenz G, Gutierrez K, Bach M, Katschnig H. A case of Asperger's syndrome first diagnosed in adulthood. Psychopathology 1999;32:43–6.
10. Frazier J, Doyle R, Chiu S, Coyle J. Treating a child with Asperger's disorder and comorbid bipolar disorder. Am J Psychiatry 2002;159:13–21.
11. Milton J, Duggan C, Latham A, Tantam D. Case history of comorbid Asperger's syndrome and paraphilic behavior. Med Sci Law 2002;42:237–44.
12. Murrie DC, Warren JI, Kristiansson M, Dietz P. Asperger's syndrome in forensic settings. Int J Forensic Ment Health 2002;1:59–70.
13. Silva JA, Ferrari MM, Leong GB. The case of Jeffrey Dalmer: serial sexual homicide from a neuropsychiatric developmental perspective. J Forensic Sci 2002;47:1–13.
14. Silva JA, Ferrari MM, Leong GB. Asperger's disorder and the origins of the Unabomber. Am J Forensic Psychiatry 2003;24:5–43.
15. Palermo MT. Pervasive developmental disorders, psychiatric comorbidities, and the law. Int J Offender Ther Comp Criminol 2004;48:40–8.
16. Schwartz-Watts DM. Asperger's disorder and murder. J Am Acad Psychiatry Law 2005;33:390–3.
17. Silva JA, Leong GB, Smith RL, Hawes E, Ferrari MM. Analysis of serial homicide in the case of Joel Rifkin using the neuropsychiatric developmental model. Am J Forensic Psychiatry 2005;26:25–55.
18. Haskins B, Silva JA. Asperger's disorder and criminal behavior: forensic-psychiatric considerations. J Am Acad Psychiatry Law 2006;34:374–84.

19. Katz N, Zemishlany Z. Criminal responsibility in Asperger's syndrome. Isr J Psychiatry Relat Sci 2006;40:166–73.
20. Griffin-Shelley E. An Asperger's adolescent sex addict, sex offender: a case study. Sex Addict Compulsivity 2010;17: 46–64.
21. Murphy D. Extreme violence in a man with an autistic spectrum disorder: assessment and treatment within high-security psychiatric care. J Forens Psychiatry Psychol 2010; 21: 462–77.
22. Radley J, Shaherbano Z. Asperger syndrome and arson: a case study. Adv Ment Health Intellect Disabil 2011;5:32–6.
23. Tochimoto S, Kurata K, Munesue T. 'Time slip' phenomenon in adolescents and adults with autism spectrum disorders: case series. Psychiatry Clin Neurosci 2011;65:381–3.
24. White P, O'Reilly M, Fragale C, et al. An extended functional analysis protocol assesses the role of stereotypy in aggression in two young children with autism spectrum disorder. Res Autism Spectr Disord 2011;5:784–9.
25. Singh G, Coffey B. Sexual obsessions, compulsions, suicidality and homicidality in an adolescent diagnosed with bipolar disorder not otherwise specified, obsessive-compulsive disorder, pervasive developmental disorder not otherwise specified, and mild retardation. J Child Adolesc Psychopharmacol 2012;22: 250–3.
26. Baliousis M, Vollm B, Banerjee P, Duggan C. Autistic spectrum disorder, personality disorder and reading disability: a complex case that falls between the cracks? J Forens Psychiatry Psychol 2013;24:286–92.
27. Frank GKW. An 11-year-old boy with Asperger's disorder presenting with aggression. Am J Psychiatry 2013;170:963–6.
28. Kanner L. Autistic disturbances of affective contact. Nerv Child 1943;2:217–50.
29. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington, DC: APA, 1993.
30. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Arlington, VA: APA, 2013.
31. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed., text revision. Washington, DC: APA, 2000.
32. World Health Organization. The ICD-10 classification of mental and behavioral disorders: clinical descriptions and diagnostic guidelines. Geneva: WHO, 1992.
33. Gillberg IC, Gillberg C. Asperger syndrome—some epidemiological considerations: a research note. J Child Psychol Psychiatry 1989;30:631–8.
34. Centers for Disease Control and Prevention. Prevalence of autism spectrum disorder among children aged 8 years—autism and developmental disabilities monitoring network, 11 sites, United States, 2010. MMWR Surveill Summ 2014;63:1–21.
35. Duggal H. Bipolar disorder with Asperger's disorder. Am J Psychiatry 2003;160:184–5.
36. Espinoza LF. Criminal autistic psychopathy: the mind of a serial killer. Psyccritiques 2014;59:1–5.
37. Niditch L, Varela R, Kamps J, Hill T. Exploring the association between cognitive functioning and anxiety in children with autism spectrum disorders: the role of social understanding and aggression. J Clin Child Psychol 2012;41:127–37.
38. Ghaziuddin M, Tsai L, Ghaziuddin N. Brief report: violence in Asperger syndrome, a critique. J Autism Dev Disord 1991; 21:349–54.
39. Scragg P, Shah A. Prevalence of Asperger's syndrome in a secure hospital. Br J Psychiatry 1994;165:679–82.
40. Hare DJ, Gould J, Mills R, Wing L. A preliminary study of individuals with autistic spectrum disorders in three special hospitals in England. London: National Autistic Society, 1999.
41. Siponmaa L, Kristiansson M, Jonson C, Nyden A, Gillberg C. Juvenile and young adult mentally disordered offenders: the role of child neuropsychiatric disorders. J Am Acad Psychiatry Law 2001;29:420–6.
42. Soderstrom H, Nilsson T, Sjodin A-K, Carlstedt A, Forsman A. The childhood-onset neuropsychiatric background to adult psychopathic traits and personality disorders. Compr Psychiatry 2005;46:111–6.
43. Woodbury-Smith MR, Clare ICH, Holland AJ, Kearns A. High functioning autistic spectrum disorders, offending and other law-breaking: findings from a community sample. J Forens Psychiatry Psychol 2006;17:108–20.
44. Allen D, Evans C, Hider A, Hawkins S, Peckett H, Morgan H. Offending behaviour in adults with Asperger syndrome. J Autism Dev Disord 2008;38:748–58.
45. Mouridsen SE, Rich B, Isager T, Nedergaard NJ. Pervasive developmental disorders and criminal behaviour: a case control study. Int J Offender Ther Comp Criminol 2008;52:196–205.
46. Langstrom N, Grann M, Ruchkin V, Sjostedt G, Fazel S. Risk factors for violent offending in autism spectrum disorder: a national study of hospitalized individuals. J Interpers Violence 2009;24:1358–70.
47. Bronsard G, Botbol M, Tordjman S. Aggression in low functioning children and adolescents with autistic disorder. PloS ONE 2010;5:1–5.
48. Kanne S, Mazurek M. Aggression in children and adolescents with ASD: prevalence and risk factors. J Autism Dev Disord 2011;41:926–37.
49. Cheely C, Carpenter L, Letourneau E, Nicholas J, Charles J, King L. The prevalence of youth with autism spectrum disorders in the criminal justice system. J Autism Dev Disord 2012;42:1856–62.
50. Mayes SD, Calhoun SL, Aggarwal R, et al. Explosive, oppositional, and aggressive behavior in children with autism compared to other clinical disorders and typical children. Res Autism Spectr Disord 2012;6:1–10.
51. Robinson L, Spencer MD, Thomson LDG, et al. Evaluation of a screening instrument for autism spectrum disorders in prisoners. PLoS One 2012;7:1–8.
52. Mazurek M, Kanne S, Wodka E. Physical aggression in children and adolescents with autism spectrum disorders. Res Autism Spectr Disord 2013;7:455–65.
53. Keefer A, Kalb L, Mazurek M, Kann S, Freedman B, Vasa R. Methodological considerations when assessing restricted and repetitive behaviors and aggression. Res Autism Spectr Disord 2014;8:1527–34.
54. Hill A, Zuckerman K, Hagen A, et al. Aggressive behavior problems in children with autism spectrum disorders: prevalence and correlates in a large clinical sample. Res Autism Spectr Disord 2014;8:1121–33.
55. Søndenaa E, Helverschou S, Steindal K, Rasmussen K, Nilsson B, Nøttestad J. Violence and sexual offending behavior in people with autism spectrum disorder who have undergone a psychiatric forensic examination. Psychol Rep 2014;115: 32–43.
56. Ehlers S, Gillberg C. The epidemiology of Asperger syndrome. A total population study. J Child Psychol Psychiatry 1993;34: 1327–50.
57. First MB, Gibbon M, Spitzer RL, Williams JB. User's guide for the Structured Clinical Interview for DSM-IV Axis I disorders—research version 2.0 (SCID-I). New York: State Psychiatric Institute, Biometrics Research Department, 1996.
58. Gillberg C, Gillberg IC, Rastam M, Wentz E. The Asperger Syndrome (and high-functioning autism) Diagnostic Interview (ASDI): a preliminary study of a new structured clinical interview. Autism 2001;5:57–66.

59. Baron-Cohen S, Wheelwright S, Skinner R, Martin J, Clubley E. The autism-spectrum quotient (AQ): evidence from Asperger syndrome/high-functioning autism, males and females, scientists and mathematicians. J Autism Dev Disord 2001;31:5–17.
60. Lord C, Rutter M, Le Couteur A. Autism Diagnostic Interview—Revised: a revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. J Autism Dev Disord 1994;24:659–85.
61. Wechsler D. Wechsler Abbreviated Scale of Intelligence. New York: Psychological Corporation, 1999.
62. Lord C, DiLavorne PC, Risi S. Autism Diagnostic Observation Schedule. Los Angeles, CA: Western Psychological Services, 2002.
63. Constantino JN, Davis SA, Todd RD, Schindler MK, Gross MM, Brophy SL. Validation of a brief quantitative measure of autistic traits: comparison of the social responsiveness scale with the autism diagnostic interview revised. J Autism Dev Disord 2003;33:427–33.
64. Lam KSL, Aman MG. The repetitive behavior scale revised: independent validation in individuals with autism spectrum disorders. J Autism Dev Disord 2007;37:855–66.
65. Reese RM, Richman DM, Belmont JM, Morse P. Functional characteristics of disruptive behavior in developmentally disabled children with and without autism. J Autism Dev Disord 2005;35:419–28.
66. Mayes SD, Calhoun SL, Murray MJ, et al. Comparison of scores on the Checklist for Autism Spectrum Disorder, Childhood Autism Rating Scale (CARS), and Gilliam Asperger's Disorder Scale (GADS) for children with low functioning autism, high functioning autism, Asperger's disorder, ADHD, and typical development. J Autism Dev Disord 2009;39:1682–93.
67. Achenbach TM, Rescorla L. Manual for the ASEBA school-age forms & profiles: an integrated system of multi-informant assessment. Burlington, VT: Achenbach System of Empirically Based Assessment, 2001.
68. Silva J, Leong G, Ferrari M. A neuropsychiatric developmental model of serial homicidal behavior. Behav Sci Law 2004;22:787–99.
69. Newman SS, Ghaziuddin M. Violent crime in Asperger syndrome: the role of psychiatric comorbidity. J Autism Dev Disord 2008;38:1848–52.
70. Bjorkly S. Risk and dynamics of violence in Asperger's syndrome: a systematic review of the literature. Aggress Violent Behav 2009;14:306–12.
71. Cashin A, Newman C. Autism in the criminal justice detention system: a review of the literature. J Forensic Nurs 2009;5:70–5.
72. Browning A, Caulfield L. The prevalence and treatment of people with Asperger's syndrome in the criminal justice system. Criminol Crim Justice 2011;11:165–80.
73. Gunasekaran S, Chaplin E. Autism spectrum disorders and offending. Adv Ment Health Intellect Disabil 2012;6:308–13.
74. Lerner M, Haque OS, Northrup EC, Lawer L, Bursztajn HJ. Emerging perspectives on adolescents and young adults with high-functioning autism spectrum disorders, violence, and criminal law. J Am Acad Psychiatry Law 2012;40:177–90.
75. Mouridsen SE. Current status of research on autism spectrum disorders and offending. Res Autism Spectr Disord 2012;6:79–86.
76. King C, Murphy G. A systematic review of people with autism spectrum disorder and the criminal justice system. J Autism Dev Disord 2014;44:2717–33.
77. Matson J, Adams H. Characteristics of aggression among persons with autism spectrum disorders. Res Autism Spectr Disord 2014;8:1578–84.
78. Pugliese C, White B, White S, Ollendick T. Social anxiety predicts aggression in children with ASD: clinical comparisons with socially anxious and oppositional youth. J Autism Dev Disord 2013;43:1205–13.
79. Woodbury-Smith M, Clare I, Holland A, Kearns A, Staufenberg E, Watson P. A case-control study of offenders with high functioning autistic spectrum disorders. J Forens Psychiatry Psychol 2005;16:747–63.
80. Pouw L, Rieffe C, Oosterveld P, Huskens B, Stockmann L. Reactive/proactive aggression and affective/cognitive empathy in children with ASD. Res Dev Disabil 2013;34:1256–66.
81. Loeber R, Lacourse E, Homish DL. Homicide, violence, and developmental trajectories. In: Tremblay RE, Hartup WW, Archer J, eds. Developmental origins of aggression. New York: Guilford, 2005;202–19.
82. Baez S, Rattazzi A, Gonzalez-Gadea M, et al. Integrating intention and context: assessing social cognition in adults with Asperger Syndrome. Front Hum Neurosci 2012;6:1–21.
83. Cappedocia MC, Weiss J. Review of social skills training groups for youth with Asperger syndrome and high functioning autism. Res Autism Spectr Disord 2011;5:70–8.
84. Stichter JP, Herzog MJ, Visovsky K, et al. Social competence intervention for youth with Asperger syndrome and high-functioning autism: an initial investigation. J Autism Dev Disord 2010;40:1067–79.
85. Stichter JP, O'Connor KV, Herzog MJ, Lierheimer K, McGhee S. Social competence intervention for elementary students with Asperger's syndrome and high-functioning autism. J Autism Dev Disord 2012;42:354–66.
86. Donoghue K, Stallard P, Kucia J. The clinical practice of Cognitive Behavioural Therapy for children and young people with a diagnosis of Asperger's syndrome. Clin Child Psychol Psychiatry 2011;16:89–102.
87. Samson AC, Huber O, Gross JJ. Emotion regulation in Asperger's syndrome and high-functioning autism. Emotion 2012;12:659–65.
88. Myles BS. Behavioral forms of stress management for individuals with Asperger syndrome. Child Adolesc Psychiatr Clin N Am 2003;12:123–41.
89. Sofronoff K, Attwood T, Hinton S, Levin I. A randomized controlled trial of a cognitive behavioural intervention for anger management in children diagnosed with Asperger syndrome. J Autism Dev Disord 2007;37:1203–14.
90. Prizant BM, Wetherby AM, Rubin E, Lauret A. The SCERTS model: a transactional, family-centered approach to enhancing communication and socioemotional abilities of children with autism spectrum disorder. Infants Young Child 2003;16:296–316.
91. Scarpa A, Reyes NM. Improving emotion regulation with CBT in young children with high functioning autism spectrum disorders: a pilot study. Behav Cogn Psychother 2011;39:495–500.
92. Kaartinen M, Puura K, Helminen M, Salmelin R, Pelkonen E, Juujärvi P. Reactive aggression among children with and without autism spectrum disorder. J Autism Dev Disord 2014;44:2383–91.
93. Lew M. Dialectical behavioral therapy for adults who have intellectual disability. In: Fletcher RJ, ed. Psychotherapy for individuals with intellectual disability. Kingston, NY: NADD, 2011;37–65.
94. Brown JF, Brown MZ, Dibiasio P. Treating individuals with intellectual disabilities and challenging behaviors with adapted dialectical behavior therapy. J Ment Health Res Intellect Disabil 2013;6:280–303.
95. Sakdalan JA, Shaw J, Collier V. Staying in the here-and-now: a pilot study on the use of dialectical behavior therapy group skills training for forensic clients with intellectual disabilities. J Intellect Disabil 2010;54:568–72.

96. Verhoeven M. Journeying to wise mind: dialectical behavior therapy and offenders with an intellectual disability. In: Craig LA, Browne KD, Lindsay WR, eds. Assessment and treatment of sexual offenders with intellectual disabilities: a handbook. New York: Wiley, 2011;317–40.
97. Singh NN, Lancioni GE, Singh AD, Winton AS, Singh AN, Singh J. Adolescents with Asperger syndrome can use a mindfulness-based strategy to control their aggressive behavior. Res Autism Spectr Disord 2011;5:1103–9.
98. Thompson L, Thompson M, Reid A. Functional neuroanatomy and the rationale for using EEG biofeedback training for clients with Asperger's Syndrome. Appl Psychophysiol Biofeedback 2010;35:39–61.
99. Thompson L, Thompson M, Reid A. Neurofeedback outcomes in clients with Asperger's syndrome. Appl Psychophysiol Biofeedback 2010;35:63–81.
100. McCracken JT, McGough J, Shah B, et al. Research Units on Pediatric Psychopharmacology Autism Network. Risperidone in children with autism and serious behavioral problems. N Engl J Med 2002;347:314–21.
101. McDougle CJ, Holmes JP, Carlson DC, Pelton GH, Cohen DJ, Price LH. A double-blind, placebo-controlled study of risperidone in adults with autistic disorder and other pervasive developmental disorders. Arch Gen Psychiatry 1998;55:633–41.
102. Ghanizadeh A, Sahraeizadeh A, Berk M. A head-to-head comparison of aripiprazole and risperidone for safety and treating autistic disorders: a randomized double blind clinical trial. Child Psychiatry Hum Dev 2014;45:185–92.
103. Hollander E, Soorya L, Chaplin W, et al. A double-blind placebo-controlled trial of fluoxetine for repetitive behaviors and global severity in adult autism spectrum disorders. Am J Psychiatry 2012;169:292–9.
104. Tsai L. Asperger syndrome and medication treatment. Focus Autism Other Dev Disabil 2007;22:138–48.
105. Handen B, Lubetsky M. Pharmacotherapy in autism and related disorders. Sch Psychol Q 2005;20:155–71.
106. Kawakami C, Ohnishi M, Sugiyama T, Someki F, Nakamura K, Tsujii M. The risk factors for criminal behaviour in high-functioning autism spectrum disorders (HFASDs): a comparison of childhood adversities between individuals with HFASDs who exhibit criminal behaviour and those with HFASD and no criminal histories. Res Autism Spectr Disord 2012;6:949–57.
107. Tsai L. Asperger's disorder will be back. J Autism Dev Disord 2013;43:2914–42.