

Neuroscience for Social Work

Current Research and Practice



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Management of Violence and Aggression in Schools

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In considering the neuroscience implications for management of violence and aggression in schools, it is necessary to begin with consideration of the knowledge base on neurobiological components of aggression overall. Contributions of neurobiological factors to violence and aggression have received less attention in the social work literature than psychosocial factors (e.g., Fraser, 1996), as is true of many behaviors that are a focus of social work practice (Johnson, 1996; Matto & Strolin-Goltzman, 2010). Neurobiological factors in aggression, indeed, have historically received less attention in most disciplines (Caspi & Moffitt, 2006; Newman, Fox, Harding, Mehta, & Roth, 2004), with the most influential and empirically supported unified theory in the field being the social learning theory of aggression developed by Bandura (1978).

Biological factors hypothesized on the basis of animal and human studies to contribute to violence and aggression, including youth violence and early childhood aggressiveness, include imbalances in serotonin (Moore, Scarpa, & Raine, 2002) or trace minerals (Sands, Morris, Dratz, & Pilgeram, 2009) or hormones, especially testosterone (Archer, Graham-Kevan, & Davies, 2005; Mysterud & Poleszynski, 2003), environmental toxin exposures that affect these neurochemicals (Barfield, 2011; El-lethey, Kamel, & Shaheed, 2011), and low IQ. Frontal lobe underpinnings of hyperactivity, impulsivity, and executive function deficits have also been identified in research on the relationship between untreated behavioral dysregulation and developmental trajectories of externalizing behavior disorders from early childhood to young adulthood (Burke, Loeber, & Birmaher, 2004;

Johnson, 1996). Generalized frontal lobe dysfunction has also been consistently noted in a large literature on violent and aggressive behaviors among adults with antisocial personality disorder (Brower & Price, 2001), as has reduced serotonin regardless of type of violence and psychiatric problems (Moore et al., 2002). Androgen mediation of aggression in males has been located in the anterior hypothalamic preoptic area of the brain (Barfield, 2011). In addition to the aforementioned etiology of frontal lobe dysfunctions accounting for aggression, the literature has provided strong support for the influential role of genetic liability for aggression and aggressive antisocial behaviors (Burt, 2009; Caspi et al., 2002; Larsson, Viding, & Plomin, 2008; Smith-Osborne, Wilder, & Reep, 2013). Neural circuitry associated with empathy versus callousness has been found to have strong reciprocal connections with peripheral nervous system axes associated with stress-reactive hormones like cortisol (Shirtcliff et al., 2009). These physiological and brain neural circuit findings suggest that individuals with this neural signature, regardless of age, may have difficulty perceiving and caring about their own emotions and distress, as well as those of others. These findings also pose additional hypotheses to pursue in differentiating the neural characteristics and trajectories of youth engaging in violence against others, contrasted with those who act out and appear callous but engage in self-injurious behaviors. Self-injurious behaviors may be prevalent in school bullying across roles (Winsper, Leraya, Zanarini, & Wolke, 2012), and have been associated with the opposite triggers of emotional blunting and emotional distress. Support has also been found across etiologies for the relative stability of high-aggression and low-aggression phenotypes in their physiological, cognitive, and behavioral expression over time throughout the developmental trajectory, lending further weight to the importance of the neurological component (DeLisi, 2009; Loeber & Hay, 1997). Callousness and unemotionality, in particular when paired with impulsivity, are behaviors that have been highly associated with persisting violence from childhood to adulthood (Frick, Bodin, & Barry, 2000; Frick & White, 2008), and are considered to be core elements in the construct of psychopathy.

Specific research into violence in the schools has focused less on neurological contributors to youth aggression in the school setting, and more on hypothesized trigger behaviors or events such as bullying, social rejection, and school failure (Sexton-Radek, 2005). Investigation into a related social problem, violence in the workplace, has identified a key factor of revenge for perceived wrongs (which may be occupational or personal) attributed to subordinates, coworkers, supervisors, or the organization (Hershcovis et al., 2007). Revenge for recent or persistent social rejection has also been stated as a motive in school shootings and other school violence (Leary, Kowalski, Smith, & Phillips, 2003; Newman et al., 2004; Verlinden, Hersen, & Thomas, 2000; Yeager, Trzesniewski, Tirri, Nokelainen, & Dweck, 2011). This factor has been linked neurologically to automatic aggressive retaliation triggered by threat or punishment stimuli involving activation of

the hypothalamus-pituitary-adrenal (HPA) axis of the autonomic nervous system, and mediated by cognitive appraisal or attribution of the stimulus source. Higher levels of trait anger and interpersonal conflict and male gender were found to predict interpersonal aggression in the workplace across targets, lending some support to the central role of psychopathy proposed in DeLisi's (2009) unified theory of crime and the animal study-based hypothesis of punishment-induced aggression in the etiology of violence and child abuse (Thomas, 1995; Thyer, 1987). In contrast, job dissatisfaction and situational constraints were more predictive of organizational aggression (Hershcovis et al., 2007). However, it is important to note that studies of healthy adults under chronic stress have found cardiovascular hyper-reactivity to be associated with hostility and aggression in adults (Chida & Hamer, 2008) and conduct problems in children (Lorber, 2004), whereas studies of adults with antisocial traits found hyporeactive autonomic nervous system responses (DeLisi, 2009) or nonsignificant associations with heart reactivity (Lorber, 2004). These physiological correlates with behavior, then, may vary by age and stimulus valence, from highly negative to neutral (Lorber, 2004).

Nevertheless, a multifactorial unified theory of aggression that includes neurological dimensions has yet to receive the level of scientific acceptance enjoyed by the social learning theory of aggression. It has been left to other venues, such as the popular TV series *Dexter* (Cerone, Phillips, & Rosenberg, 2006), to explore the nature/nurture implications of a strong genetic loading for violent, antisocial behaviors. DeLisi (2009) has approached this goal by suggesting psychopathy as a unified theory of crime, both violent and nonviolent. Empirical definition of the construct of psychopathy includes neurobehavioral dimensions of genetic liability, lower autonomic nervous system arousal, structural brain abnormalities (e.g., interhemispheric functional asymmetries and increased functional interhemispheric connectivity in the corpus callosum), and impaired glucose metabolism and blood flow in frontal lobe areas. DeLisi points to psychopathy research, which particularly finds associations between frontal lobe deficits and the characteristics of hyperactivity, impulsivity, and executive function deficits implicated in the etiology of stable aggressive and violent behavioral trajectories (Burke et al., 2002). This chapter next explores the utility of applying this unified theory with theory of developmental trajectories of childhood aggression to predict possible neuroscience-informed policy and practice strategies for improved outcomes in the management of violence and aggression in schools.

PRACTICE IMPLICATIONS

Utilizing the neuroscience-supported unified theory of crime and developmental trajectories evidence, the following assessment questions can be considered in making practice decisions relating to school violence mitigation

when working with individual students. Does the severity of the neurological loading respond to a requisite level of intensity of intervention? Does intensity of intervention interact with level of severity to moderate developmental psychopathy or other aggressive trajectories? Alternatively, do specified protective mechanisms or clusters of them fully mediate single or cumulative risk factors for psychopathy or other sources of aggression (such as perceived punishment/threat) at specific turning points in the developmental trajectory, or overall?

The *Dexter* series (Cerone et al., 2006), for example, posits that a single role model in a strong attachment bond (the adoptive father) can provide intensive behavioral intervention ("the Code") over early development within an enriched environment (e.g., supportive family, educational opportunity, residential stability) to moderate a genetically predisposed aggressive psychopathy trajectory. The empirical effectiveness of similar real-world therapeutic intervention models, which target early aggressiveness and youth conduct disorder with appropriate medication and intensive, parent-involved behavioral therapy, such as Parent-Child Interaction Therapy and Multisystemic Therapy (Eyberg, Nelson, & Boggs, 2008), has been promising, but has not been directly studied for its impact on school violence prevalence.

Here is an approach to addressing single risk factors at turning points in developmental trajectories. Knowledge of typical age of onset of the single risk factor of disruptive behavior disorder (American Psychiatric Association, 2000) may be indicative of critical turning points in developmental trajectories for aggression. This knowledge base would suggest that school-based initiatives to screen for these disorders (Miller et al., 2000; Walker, Cheney, Stage, & Blum, 2005) and secure optimal treatment as a protective mechanism at the relevant age ranges (e.g., all 6 to 7 year olds, 8- to 10-year-old males, 10- to 13-year-old females) may be important in managing school violence. Screening may be done by parent report with standardized clinical assessment instruments such as the Child Behavior Checklist (Achenbach, 1999) or a multistage teacher report process, such as the Systematic Screening for Behavior Disorders Procedure (Walker et al., 1994). It is important to note in the screening context, however, that findings are mixed regarding associations between school bullying and other forms of school violence, with bully victims suggested to be more proactively and reactively aggressive than either bullies or victims (Berger, 2007; Vlachou, Andreou, Botsoglou, & Didaskalou, 2011). Screening for the more rare and idiosyncratic adolescent "school shooter" has not reached the stage of a formal standardized process (Leary et al., 2003; Newman et al., 2004; Verlinden et al., 2000; Yeager et al., 2011). Common patterns have been observed of social rejection, an interest in firearms or bombs, a preoccupation with death or Satanism, and symptoms of depression, impulsivity, or sadism (Leary et al., 2003).

School social workers can mobilize school teams to provide psychoeducational interventions to parents as the first stage of treatment. Psychoeducation should include discussion of ways to limit lethality of school violence by taking steps to control the at-risk children's and adolescents' access to firearms in the home, including monitoring of internet purchasing and mail deliveries (Speaker & Petersen, 2000; Verlinden et al., 2000). School social workers also have an important role in assisting school counselors and health staff in securing ongoing collaborations with community providers who utilize evidence-based treatments in order to ensure timely referral and full access to care for identified families across the range of health insurance and benefit eligibilities.

Social workers in practice in the community can assist schools by participating actively in such collaborations; collaboration can include ongoing updates to schools of the social work practice's availability to accept new clients, age groups served in group and individual modalities, insurance plans accepted, and manualized interventions provided. Community practitioners can also be instrumental in forming interagency consortia of schools, agencies, and private practitioners to identify gaps in needed services and to bring training for needed evidence-based interventions to the community. Social work education programs and continuing education services can play a pivotal role in bringing up-to-date research findings on the neurological underpinnings of school violence to their community.

Subclinical presentations of these disorders and nonclinically specific risk factors found during regular screening could be addressed with less intensive, preventive cognitive remediation and behavioral regulation school-based or after-school programs. Utilizing standardized intervention protocols and materials, such programs can be implemented with adequate fidelity by either teachers in the classroom or by school social workers through in-school or after-school groups (either independently or as part of after-school day care). This approach may address the matching of intensity of intervention to the severity of neurological loading. An example of such a risk factor would be general executive function deficit associated with attribution errors in appraising sources of threat/punishment, and related physiological reactivity dysregulation. Involvement of school health staff in monitoring simple physiological indicators of stress response (hyperarousal and hypoarousal) such as heart rate and blood pressure could provide useful feedback to staff and families on their child's progress in the intervention.

Examples of universal in-school programs that target neurological risk factors represented by executive function deficits and autonomic nervous system arousal irregularities are Promoting Alternative Thinking Strategies (Greenberg et al., 2003), Positive Action (U.S. Department of Education What Works Clearinghouse, 2007), and Second Step (Frey, Hirschstein, & Guzzo, 2000). Hahn et al. (2007) provide a systematic review

of effectiveness of universal school-based aggressive behavior prevention programs, although without addressing neurological components. These programs have been evaluated primarily for elementary and middle school populations, although some are designed to be applied through grade 12. At this lower level of severity, programs must be monitored for increased prosocial behavioral and social connectedness outcomes as well as decreased attributional and threat appraisal errors and physiological reactivity.

To answer the question of moderation of developmental trajectories by intensity of intervention interaction with level of severity of violence-related risk, schools can monitor proximal and distal outcomes over time, controlling for numbers of cases identified. Proximal outcomes include rate of disciplinary referrals and rate of prosocial behaviors, as well as individual response to intervention using the selected assessment or screening tool. Distal outcomes include rates of school violence incidents over a 5- to 10-year period and longitudinal follow-up of treated children through high school graduation. Both types of outcomes can guide schools in modifying the intensity of selected interventions to provide a better fit with levels of risk factors.

Should school violence occur, teachers and students should receive evidence-based crisis intervention services (psychological first aid) as indicated in the aftermath of any disaster, and for which schools now have routine protocols (Callahan, 1998). These protocols should include administration of a standardized instrument such as the Teachers' Reactions to School Violence Scale (Ting, Sanders, & Smith, 2002) to screen teachers at high risk of persisting distress and burnout after an episode of school violence. Distress may take the form of posttraumatic symptoms, alienation, or avoidance behaviors with students, and can be alleviated if identified promptly.

POLICY IMPLICATIONS

When examining neurological underpinnings to violence in schools, the role of health disparities and related educational status disproportionalities emerge in the policy context. School behavior problems associated with the disproportionate prevalence of asthma and lead poisoning among Black youth are one example of this facet of the problem (Watts & Erevelles, 2004), as are racial disproportionalities in dropout rates related to student victimization (Peguero, 2011). At the school level, school systems can enact policies facilitating surveillance of such disparities as a first step to tailoring existing school health and dropout prevention programs for target groups. School social workers can be instrumental in assisting their schools in avoiding the "slippery slope" of labeling problem students, which has been implicated in the disproportionality of minority

students receiving special education services and disciplinary measures in nonmainstreamed settings (Watts & Erevelles, 2004), and thus being at increased risk for social isolation and victimization within the school setting (Peguero, 2011).

Enacting schoolwide screening policies for behavioral risk factors, as discussed above, has shown promise as a violence prevention step for some time. The next step to enhance such policies would be periodic review of policies specifically to ensure that they remain consistent with the emerging neuroscience evidence in the area of violence and aggression. It is likely that ongoing research will elucidate the variations in physiological indicators correlated with aggression risk by age and stimulus valence in the near future, thus enabling schools to match the type and intensity of assessment and intervention more effectively for different trajectories and risk mechanisms (Lorber, 2004). The emerging technology in neuroimaging and computer-based cognitive remediation may also offer new intervention opportunities to school systems in the future, if they are proactive in monitoring knowledge dissemination in these areas and ready to be early innovators in adopting policies consistent with those findings. Similarly, assistive technologies relevant to brain-based disorders may soon be as ubiquitous as assistive technologies for mobility impairments. Advances in technologies for the cognitive declines of aging and the invisible injuries of the current wars could pave the way for adaptations for schoolchildren with psychopathy risk factors. Rapid uptake of these advances will depend on the awareness and readiness of policymakers at the school and school system levels, as well as state and federal levels.

Evaluation at the individual school and systems levels of the interface between dropout rates, dropout prevention programs, and vocational preparation curricula could inform policy relating to neuroscience-informed management of school violence. Schools have been rewarded by national and regional educational policies for focusing efforts on college-bound students and the periodic standardized tests that assess the quality of schools to produce and prepare them. Such policies may put minority and non-college-bound students at further risk of high school dropout (Altshuler & Schmautz, 2006). Concomitantly, skills vocational programming at high schools has increasingly targeted students who pursue college preparatory-level courses, leaving fewer viable training options for non-college track students (Fletcher, 2006). Such policies put students with neurological risks for school aggression at further disadvantage with respect to social connectedness and meaningful achievement. As modifications have been made to the No Child Left Behind policy implementation over the last four years, schools should carefully monitor the associations among the dropout rates, dropout prevention programs, and accessibility of vocational preparation curricula to a wide range of students, and any attendant racial and ethnic and socioeconomic disproportionalities.

RESEARCH IMPLICATIONS

This chapter's use of integrative theory as a frame for examining the neurological underpinnings of school violence and implications for its prevention and management is consistent with scholarly calls for interdisciplinary approaches to this complex social problem (Henry, 2009). The theories integrated here include developmental life course theory and the unified theory of crime applied with attention to their neurodevelopmental evidence components. Future social work theory contribution in this area could benefit from increased incorporation of physiological data and genetic biomarkers into research relevant to school violence and to the integration of social learning theory with neuroscience evidence in applied research on violence and aggression among schoolchildren. Extension of animal study results to human studies would further inform and test theoretical models of human aggression. Integrative application of workplace violence constructs to the school setting may also lead to fruitful theory development and testing.

Increased multidisciplinary longitudinal research is needed to describe the developmental trajectories and outcomes of school violence perpetrators who survive through adulthood. Such studies would have as a goal the identification of distinct turning points in trajectories for perpetrators with differing neurogenetic risk, brain chemistry and anatomy, and physiological and behavioral profiles. Such research will become increasingly feasible given ongoing advances in neuroimaging and molecular brain studies, should sufficient research dollars be available.

In the intervention research area, replication of evidence-based treatment trials for child and adolescent externalizing behaviors, with the addition of relevant risk and protective biomarkers as independent variables, is urgently needed. Neuroscience-informed dismantling studies to isolate the "active ingredients" of effective interventions at different risk and treatment dosage levels are now feasible, given the well-established cadre of promising practices at both the treatment and prevention level of intervention. Development of lower cost, brief adaptations of promising treatment protocols should be undertaken to provide greater access for low-income and medically underserved areas and health disparities groups. Integrated behavioral health care in primary care settings is also worthy of research in this problem area, particularly with application to high schools that have onsite primary care clinics. Finally, research in the translational science arena would be useful in disseminating feasible implementation of the cadre of known promising practices to the individual school level and the community in which it is embedded.

ETHICAL/LEGAL ISSUES

Addressing the management of violence and aggression in schools to incorporate neuroscience evidence should enhance ethical practice by

increasing the uptake and application of evidence-based assessment and intervention in this domain from a public health and positive youth development perspective, rather than the criminal justice and deviance perspective that has dominated. Ongoing ethical challenges posed by improved screening and diagnosis and the concomitant potential for collateral damage through labeling and stigma and related disproportionality will require vigilance. Treatment bias against minorities with behavioral symptoms, and against those with disruptive behavior disorders as a group, must be mitigated by provider and educator training regarding latent discriminatory attitudes and their effect on treatment and behavior management decisions by experts (Green et al., 2007).

To the extent school management is so addressed, the emphasis on legal issues and legal system solutions may be reduced in favor of mental health issues and health service system solutions. As increased health care access, earlier intervention, and universal school system prevention efforts proliferate, the crisis event management by police and legal systems of extreme violence by older teens and young adults in academic settings may be abated.

Case Study

Joey is a 5-year-old African American male attending a public kindergarten in a small rural town. He had been suspended four times for refusal to follow directions, continuous disruptive behavior, and aggression toward his teacher and classmates. The county school social worker was asked to make a home visit to assess and contribute to the family's and multidisciplinary team's plans for Joey. The current school recommendation was for expulsion.

The social worker met with Joey's guardians, his maternal great-aunt and uncle, to begin the assessment and do a functional applied behavioral analysis of Joey's behavior in the home setting. His great-aunt and uncle had been primary caregivers for Joey since infancy, originally with his mother residing with them during the first year of his life. His mother reportedly had drinking problems and intellectual disability. She moved away to find a job about four years ago, so the household at that time consisted of Joey, his great-aunt and uncle, and their adult daughter.

The social worker performed a follow-up assessment of Joey in an office setting, and also interviewed Joey's teacher, other school staff, and reviewed school disciplinary and assessment documents. The worker observed signs of fetal alcohol effects in Joey's appearance and behavior, which were confirmed by a careful maternal and extended family history and by medical records once the social worker obtained them from Joey's physician and birth hospital.

Joey demonstrated an inability to recognize and label his own and others' emotions at an age-appropriate level, as well as callousness, lack of empathy, and unemotionality when experiencing stimuli known to elicit sympathy or distress in typically developing children. He also met diagnostic criteria for attention deficit/hyperactivity disorder (ADHD), combined type, and a very

low threshold for tolerating increasing stimuli (noise, movement, crowding, sights, aural commands, or visual signals) without becoming behaviorally dysregulated. He was able to maintain a steady, manageable arousal state under conditions either of low stimulus in a highly structured setting or of low stimulus with complete autonomy. The latter conditions characterized his home life, where his guardians reported they had no problems with him except at school. Once he began experiencing problems in school, however, they did notice increasing, random acts of aggression and destructiveness outside the home (i.e., in the backyard, neighborhood, at family gatherings). The guardians reported that Joey had had all his “baby shots,” and seemed to be growing and developing just fine in infancy. They reported only taking him to the doctor and dentist “when he is sick, and he is usually healthy,” so he had not seen a medical provider for approximately three years.

The social worker referred Joey to his doctor and to the school system neuropsychological consultant for IQ testing, neurobehavioral testing, evaluation for ADHD, and a complete physical examination. The doctor referred Joey for evaluation by a neurologist, including brain scanning and electroencephalography. The evaluations further confirmed fetal alcohol effects, borderline IQ, ADHD-combined type, a range of developmental disorders (i.e., motor coordination, speech pathologies, language processing, sensory-perceptual), and alexithymia. Behavioral and medication treatments were initiated by a multidisciplinary team, which included a speech therapist and occupational therapist. Behavioral treatments included psychoeducation and behavioral intervention training with the guardians, and behavioral modification, social skills training, and arousal regulation training for Joey. The school system provided Joey with a home-based teacher while the remediation plan was pursued.

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