The Neuroscience Behind Misbehavior: Reimagining How Schools Discipline Youth

Jennifer Lynn-Whaley*
Berkeley Law at the University of California
Arianna Gard
Berkeley Law at the University of California

Findings from neuroscience research illustrate how normal adolescent development can be derailed by exposure to early life adversity. These harmful experiences rewire neural development and impair areas of the brain responsible for impulsivity and self-control. School discipline data show that most student misbehavior has at its core a lack of self-control. As a consequence of the last two decades of an increasingly punitive orientation toward school discipline, schools' increased reliance on arrests led to unprecedented numbers of youth becoming justice-involved. Evidence overwhelmingly supports the use of cognitive therapies (which leverage the window of neuroplasticity for youth) over the use of incarceration (which exacerbates deficits and often predicts future justice involvement).

Children who experience significant adversity early in life without consistent support from caring adults are more likely to drop out to school earlier, earn less, depend more on public assistance, adopt a range of unhealthy behaviors, and live shorter, less healthy lives.
(Center on the Developing Child)

A primary purpose of this paper is to highlight how potentially volatile the intersection between normal adolescent brain maturation and the consequences of exposure to early life adversity can be for youth. Of particular importance within the context of school discipline are the deficits related to impulsivity and self-control (Blair & Diamond, 2008). Young people with existing deficits in the areas of impulsivity and self-control are at an added disadvantage entering the developmental stage of adolescence, which by definition is wrought with challenges for even the most well-adjusted youth.

*Direct correspondence to Jennifer Lynn-Whaley at the Chief Justice Earl Warren Institute on Law and Social Policy at Berkeley Law at the University of California (Jlynn-whaley@law.berkeley.edu).

These deficits result in an inability to regulate behavior and can lead to interpersonal conflict, challenges building and sustaining relationships and an increased likelihood of contact with police (Moffitt et al., 2011).

As youth with these impairments mature into young adults, the normal developmental stages of adolescence—which include risk-taking and increased reliance on peers—will further exacerbate these deficient areas. For many young people, impulsivity and low self-control associated with early life adversity combines with normal adolescent risk-taking to create a powder keg of potentially explosive behavior. At the heart of most school-based rule-breaking is a student's inability to control behavior and impulsivity (Gottfredson, 2001). While behavior should not be divorced from responsibility, these findings are vital to a developmentally informed understanding of adolescence and should guide school discipline policy. This paper aims to connect the research findings from neuroscience and highlight the relationship between early life adversity and adolescent brain development to the underlying causes of misbehavior. This paper also builds evidence to support changes in school discipline policy such that they reflect the most recent thinking on adolescent development and result in fewer young people becoming justice-involved. For youth who do become involved with the courts and the justice system, a developmental understanding of adolescence will help clarify potential sources of misbehavior in youth and offer avenues for intervention.

CHARACTERISTICS OF NORMAL ADOLESCENT RISK-TAKING

Adolescence is a transitional period of development marked by the onset of puberty, growing independence, increased reliance on peers and changes in brain maturation (Casey & Jones, 2010). Also characteristic of adolescence are risky behaviors such as unprotected sex, substance use and criminal behavior (Steinberg, 2010). While social influences account for a portion of the variance, developmental changes in brain structure and function during adolescence significantly impact reward-seeking and impulsive behaviors. Recent research in developmental neuroscience sheds light on the neural mechanisms involved in adolescent risk-taking. This research is critical to the collective understanding of teenage behavior in the context of appropriate responses to school-based rule-breaking.

Risk-taking is the result of normal reward-seeking behavior and should be anticipated as part of the normal developmental process (Dahl, 2011). Researchers propose a "dual systems model" to explain adolescent risk-taking

(Steinberg, 2010; Ernst, Pine, & Hardin, 2005). The model consists of a socio-emotional system and a cognitive control system, where the socio-emotional system explains reward-seeking behavior and the cognitive control system is responsible for impulse control. Adolescence marks the period where the structures comprising these two systems are developing at different paces, with reward-seeking areas preceding areas responsible for impulse control (Galvan et al., 2006). Consistently, research findings from neurobiology support the notion that risky behavior in adolescence is attributable, in part, to an immature cognitive control system that cannot regulate the more mature socio-emotional or reward-seeking system. Research from animal models and human brain-imaging studies supports this distinction (Casey, Duhouz, & Galvan, 2010; Casey, Getz, & Galvan, 2008).

Early adolescence marks the development of the socio-emotional system, reflecting an increase in reward-seeking behaviors that are normal during this stage of development (Casey & Jones, 2010). Localized in the limbic and paralimbic areas of the brain, the socio-emotional system includes the ventral striatum among other structures (Steinberg, 2010). Galvan et al. (2006) examined the relationship between reward processes and activity in the ventral striatum, an area of the brain previously linked to addiction and reward (Elliot, Friston, & Dolan, 2000). They operationalized reward-seeking as participants' response to monetary incentives, while simultaneously tracking their brain activity. They found that the ventral striatum was sensitive to varying magnitudes of monetary reward, and—critically—that the reward-related response was exaggerated in adolescents compared to both children and adults.

In a follow-up study, Galvan et al. (2007) found a positive association between activity in the ventral striatum and the likelihood of engaging in risky behaviors. Increased activity in the ventral striatum and other regions of the socio-emotional system result in increased reward-seeking (Ernst et al., 2005; Galvan et al., 2006). These reward-seeking behaviors peak between ages 10 and 15, decreasing or remaining stable thereafter (Casey, Duhoux, & Cohen, 2010; Steinberg et al, 2008). Given the brain's structure at this developmental stage, risky behaviors can be understood as a normal part of adolescence.

Structures in the cognitive control system responsible for impulse control and self-regulation do not develop fully until late adolescence (Casey et al., 2010; Casey & Jones, 2010; Luna et al., 2010). As the brain matures, executive functions such as planning, evaluating risks and rewards, and judgment and decision-making improve. Both synaptic pruning, which eliminates weak neural connections and strengthens stronger connections, and continued myelination of prefrontal brain regions, which enhances

connectivity between cortical and subcortical areas of the brain, lead to improved executive functioning and communication between the socio-emotional system and the cognitive control system. Adolescence marks the period during which the socio-emotional system is relatively more mature than the cognitive control system, resulting in reward-seeking without sufficient impulse control (Ernst, Pine, & Hardin, 2005). The implications of research findings that point to a dual systems model of risk-taking supports the notion that reward-seeking behavior is inherently normal for adolescents. As such, school discipline policy should be developmentally informed and rooted in the understanding of what falls into normal adolescent behavior.

Adolescents are Motivated by Peer Pressure

Extant research supports the long-held assumption that adolescents are more susceptible to peer influence than adults (Steinberg, 2009). This holds true with regard to substance use (Ennett, Bauman, Hussong, Faris, Foshee, & Cai, 2006; Steinberg, Fletcher, & Darling, 1994), delinquency (Agnew, 1991) and risk-taking (Gardner and Steinberg, 2005). As adolescents strive for independence, their desire for parental approval and guidance is overwhelmed by their desire for peer and social acceptance. Driven by a fear of rejection and a need to conform, adolescents tend to make riskier decisions.

In a study by Gardner et al. (2005), adolescents, college undergraduates and adults played a computer-simulated game of "Chicken." As with other studies of risk-taking, the adolescent sample was more likely to take the riskier course of action than either the young adult or adult samples. Researchers also found significant effects of peer presence such that, in the presence of peers versus being alone, younger participants took more risks during the game, gave greater weight to the benefits rather than the costs of risky activities, and were more likely to select risky courses of action in the risky decision-making situations. The neural architecture of the adolescent brain predisposes adolescents towards risk-taking behaviors and peer influence heightens this vulnerability.

Adolescents Prioritize Rewards Over Consequences

Future orientation is the ability to weigh risks and rewards, assess consequences and project events into the future. During adolescence, the area of the brain responsible for future planning—the prefrontal cortex—is not fully developed. As this area of the brain matures, cognitive functions such as planning and decision-making improve. This research, a keystone in the 2005

Supreme Court decision *(Roper v. Simmons)* that banned the death penalty for juveniles, affirms that structural immaturity of the prefrontal cortex limits adolescents' ability to grasp the consequences of their actions.

As found by Gardner et al. (2005) and others (Galvan et al., 2007), adolescents give more weight to reward and respond to those rewards with greater risk-taking behaviors than adults. It appears that age-related differences in risk-taking are not a function of sensitivity to risks but, rather, sensitivity to rewards (Steinberg, 2009). In deciding whether to drive above the speed limit, both adults and adolescents will assess the risks equally (e.g., getting a ticket, crashing the vehicle), but adolescents will derive greater reward than adults (e.g., the thrill of speeding, peer acceptance and approval). Additionally, as adolescents lack the cognitive maturity to anticipate long-term consequences (e.g., fatality, financial consequences), their vulnerability to high-risk behavior is increased. Developmental neurobiology suggests that the risk-taking behaviors and impulsivity characteristic of adolescence are normal, a result of both biological and social factors. While normal, premature reward-seeking behavior combined with immature impulse control parallels a system without "checks and balances." Add peer influence, lack of future orientation, and reward sensitivity, and the adolescent becomes inherently vulnerable to risky decision-making with potentially adverse consequences.

EARLY LIFE ADVERSITY IMPACTS ADOLESCENT BEHAVIOR

In addition to the progression of normal brain development, exposure to adversity early on adds to the risk of negative behavioral outcomes. Until recently, very little was known about the role of brain development in determining behavioral outcomes. Over the last two decades, advances in neuroscience have allowed researchers to develop a deeper and more nuanced understanding of how early life adversity impacts different areas of the developing brain which ultimately influence behavior. Researchers are able to state with confidence that early life experiences are "written" into our bodies and impact the developing brain architecture that supports behavior, learning and health (Center on the Developing Child, 2007).

Harmful early life experiences, such as prenatal exposure to toxins, maternal depression and stress and childhood trauma, combine with genetic predispositions to heavily influence behavioral outcomes. These factors compound with normal adolescent risk-taking to put such school-aged children at higher risk for misbehavior. A growing body of literature has

linked these experiences with several negative life outcomes that reach across a broad spectrum of issues, from behavioral problems and mental health issues to increased risk of heart disease and asthma (Center on the Developing Child, 2010). Specifically, these experiences influence how well young people respond to stress, how well they regulate their emotions and the strength of their ability to control impulses and reasoning (McEwen, 2007). The impact of early, stress-related changes in brain circuitry have been shown in animal models to influence decision-making capabilities and alter emotional states and physiological functioning that lead to substance abuse, emotional instability, aggression and stress-related disorders (Isgor et al., 2004; Weder et al., 2009).

Studies show that prenatal exposure to harmful toxins, maternal depression and stress are harmful to fetal brain development and are correlated with lower levels of cognitive functioning and self-control (Center on the Developing Child, 2007; Davis & Sandman, 2010; Mackey, Raizada, & Bunge, in press). Researchers at the University of California, Berkeley examined the impact of prenatal exposure to organophosphate pesticides (widely used on crops) and found that every tenfold increase in measures of the pesticide during pregnancy corresponded to a 5.5 point drop in overall IQ scores in the 7-year old children studied (Bouchard et al., 2011). Results from this and other studies point to the clear fact that embryonic, fetal and childhood brain development is more susceptible to damage from toxins than the adult brain (Center for the Developing Child, 2010). Resulting cognitive changes, including drops in IQ, place children at an increased risk for behavioral problems in school. Maternal stress during pregnancy results in increased levels of cortisol that reach the developing fetus during gestation. Studies show that high doses of synthetic glucocorticoids (a stress hormone) results in documented emotional disturbances in childhood, dysregulated stress responses in infancy, neurodevelopmental delays in toddlers and impaired memory in school-aged children (Davis & Sandman, 2010). In one large-scale study, children with impairments such as low self-control exhibited more adult health problems, achieved lower levels of socio-economic status and were more likely to have a criminal record than children with high self-control (Moffitt et al., 2011).

Childhood trauma, including abuse and witnessing violence, causes fear and chronic anxiety that disrupts the stress response system and results in impaired development of the prefrontal cortex (Center for the Developing Child, 2010). As mentioned earlier, this area of the brain is crucial in planning, focusing attention, decision-making and impulse control. Traumatic experiences in childhood alter brain structure such that cognitive abilities are impaired and risk for misbehavior increases. Research examining the effect of maltreatment and

aggression in school-aged children found that the sample of mistreated children exhibited significantly higher antisocial behavior scores across aggression, rule-breaking and inattention subscales (Weder et al., 2009).

Cumulatively, this research illustrates how youth who have been exposed to trauma and stress during critical stages of development are more likely to navigate their worlds with significant deficits. These findings enrich our understanding of what adolescent risk-taking looks like, and how the impact of negative outcomes resulting from early life adversity impact normal development and ultimately behavior in school.

CURRENT RESPONSES TO DISCIPLINE DON'T WORK

After the Columbine school shootings in April of 1999, the dynamics of school discipline changed significantly. The collective consciousness relating to youth and youth violence began to shift with the prediction of the juvenile "superpredator" in the early 1990s and was underscored by Columbine and subsequent school shootings. These events ushered in a new philosophical orientation towards school discipline. Schools lost their innocence as they transitioned from places where principals made calls to parents and handled rule violations themselves, to an environment where students enter school through metal detectors and school-based police officers, often called School Resource Officers, routinely manage disciplinary action. The culture that resulted from this transition created an increasingly punitive environment where, under "zero tolerance" policies, violations from the negligible to the serious were more often met with the same heavy-handed response.

The consequences of this shift in orientation have far-reaching effects that can be distilled in the emergence of the phenomenon known as the "school-to-prison pipeline." The number of suspensions, expulsions and school-based arrests which funnel unprecedented numbers of young people into the court and justice system—often for minor infractions—has skyrocketed over the last decade (Losen & Skiba, 2010; Advancement Project, 2010). Even more troubling is the overwhelming evidence that these exclusionary discipline practices have a disproportionate impact on youth of color (Sundius & Farnuth, 2008; Losen & Skiba, 2010; Losen, 2011). Nationally, suspension rates for African-American youth more than tripled since the 1970s relative to their White classmates, where by 2006, more than one out of every seven matriculating African-American youth had received at least one suspension (Losen, 2011).

However, the most compelling argument to reverse the direction of punitive policies is the research that demonstrates that the removal of students with behavior problems fails to improve safety or student behavior (Losen & Skiba, 2010). Therefore, responding to adolescent misbehavior with an array of punitive policies accomplishes neither the goals of protecting the student body nor reducing misconduct, and has little foundation for effective discipline. Furthermore, there is evidence that punitive responses imposed on youth within the juvenile justice system not only fail to reduce criminal behavior, but also effectively increase antisocial conduct and recidivism – tantamount to throwing a burn victim into fire (Henggeler & Schoenwald, 2011; Greenwood 2006; Steinberg, 2009; Holman & Ziedenberg, 2007; Fagan, 1996). Additional significant consequences include removing a young person from their family and disrupting the educational pathway. From an economic perspective, incarcerating large numbers of young people creates an unsustainable financial burden for states and counties (Advancement Project et al., 2010). There are, however, a number of interventions shown to be effective in addressing the range of adolescent needs.

RECOMMENDATIONS FOR EFFECTIVE INTERVENTIONS

At a fundamental level, changing the approach to student misbehavior from one of punishment and sanctions to one that reflects the rehabilitative capacity of young minds will go a long way toward improving student behavior, school climate and reducing court involvement. The authors of this paper recommend substituting existing disciplinary measures, including suspension, expulsion and arrest—which can postpone referral or ignore needed therapeutic treatment until the youth enters the justice system—with holistic interventions that are delivered at school. In roughly half of the country, when students are removed from school for disciplinary purposes, nothing fills that space and youth serve out the punishment at home (Fabelo et al., 2011). Every effort should be made to handle occasional antisocial or disruptive behavior within school boundaries, and in conjunction with school authorities. Young people with chronic discipline issues should be referred to an evidence-based treatment modality to be provided at school by trained professionals. Interventions at every level of severity should include mandatory parental or caregiver involvement as well as the participation of any other child welfare agency necessary to ensure appropriate intervention.

Only over the last 20 years have researchers, clinicians and criminal justice professionals developed and tested new interventions for juvenile offender populations. These evidence-based practices address multiple

aspects of the youth's social ecology, use behavioral intervention techniques and are rehabilitative rather than punitive (Henggeler et al., 2011). Effective interventions are developmentally informed and seek to build the interpersonal and cognitive skills that adolescents need to navigate their environment. Advances in evidence-based practices combined with recent findings from developmental neuroscience regarding the normative increase in risk-taking behavior during adolescence provide additional encouragement for the treatment of antisocial conduct in youth (Galvan et al., 2007; Steinberg, 2008). To the extent that antisocial behavior carried out by justice-involved youth is an extension of misbehavior in school, effective interventions used in juvenile justice settings can be adapted to work within an education setting.

Given our understanding of the immature nature of the cognitive control system and encouraging research on brain plasticity and on the trainability of cognitive control, these interventions are opportunities to work with youth when their brains are malleable and before behavior patterns become harder to change (Buschkuehl, 2011; Klingberg, 2010; Mackey, Raizada, & Bunge, in press). Neuroplasticity refers to the brain and nervous system's ability to change in structure and function as a result of input from the environment. Research shows strong links between cognitive-behavioral therapy and neuroplasticity in the human brain (Roush, 2008). While adolescents are more inclined to risk-taking and reward-seeking behaviors, skill-building in immature areas can manage these developmentally normal impulses. As the brain matures from adolescence to adulthood, the individual will carry these new interpersonal, cognitive and life skills into future behavior, offering clinicians and criminal justice professionals an opportunity to alter behavior. The following section reviews evidence-based interventions found effective with delinquent youth.

Misbehavior in school might include aggressive behavior towards teachers and peers, substance use, truancy and poor academic performance. The risky nature of these behaviors calls for interventions that bolster problem-solving, planning, and decision-making. As research from neuroscience suggests, adolescence is a period where an immature cognitive control system cannot regulate a relatively more mature socio-emotional or reward-seeking system. Skill-building interventions that bolster impulse control have the effect of minimizing risky behaviors that may lead to school disciplinary measures. Researchers Terzian, Hamilton, & Ericson (2011) conducted an evaluation study of interventions designed to reduce internalizing behaviors or socio-emotional difficulties in adolescents. They found that skill-training approaches that build cognitive-behavioral skills and social skills were most effective in reducing internalizing symptoms.

Cognitive Behavioral Therapy (CBT) is an evidence-based psychosocial intervention used both independently and in conjunction with other treatment programs (Henggeler, 2011). CBT is a time-limited "talk therapy" that seeks to change inappropriate or maladaptive thoughts that lead to poor behavioral outcomes by building interpersonal, cognitive and life skills through homework assignments, active participation and instruction (Greenwood, 2006; Skowyra et al., 2006). In an evaluation of a CBT program with adjudicated juvenile delinquents residing in locked facilities, Bogestad, Kettler, & Hagan (2010) found significantly reduced levels of cognitive distortions across multiple subscales. CBT effectively targets cognitive distortions and alters how an individual interprets and responds to situations and experiences (Bogestad et al., 2010). In criminal justice settings, CBT may take the shape of aggression replacement training, which involves CBT methods across three components: anger control, behavioral skills and moral reasoning (Skowyra et al., 2006). In an evaluation study of a school-based CBT program for aggressive boys, the treated sample displayed lower levels of substance use, higher levels of self-esteem and better social problem-solving skills (Lochman, 1992). School-based CBT builds problem-solving, emotion regulation and decision-making skills. Effective interventions for more severely antisocial youth include Functional Family Therapy, Multisystem Therapy and Multi-Dimensional Treatment Foster Care (Henggeler et al., 2011). All of these treatment methods include CBT and target problem behaviors through multiple domains. Shown effective in many evaluation studies, these evidence-based practices provide additional support for the application of CBT in school disciplinary practices.

CONCLUSION

Adolescence is an exceedingly challenging period of the normal developmental process, which can become aggravated by exposure to early life adversity. Findings from the field of neuroscience illuminate the mechanics behind youthful transgression, offering clues on how to better serve this population of youth in the community as well as within the confines of schools. Programs that focus on building skills and changing maladaptive thought and behavior patterns demonstrate the greatest efficacy in reducing antisocial behavior among youth (Greenwood, 2008). Given the expanding literature on the harm done by punitive disciplinary policies, it is incumbent upon school educators, administrators, and support professionals as well as the judicial and justice system, to reverse these trends and incorporate evidence-based rehabilitation practices so that young people are afforded every opportunity to succeed.

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Jennifer Lynn-Whaley, Ph.D., is a senior research associate at the Chief Justice Earl Warren Institute on Law and Social Policy at Berkeley Law at the University of California. Her research interests include alternatives to incarceration, reducing disproportionate minority contact, juvenile justice policy and the use of cognitive neuroscience to inform prevention strategies for at-risk youth. She has publications on topics that include juvenile transfer laws, children of incarcerated parents, mental health services in the juvenile justice system, and mental health courts. She received her Ph.D. from American University's School of Public Affairs in the Department of Justice, Law, and Society.

Arianna Gard is a research assistant at the Chief Justice Earl Warren Institute on Law and Social Policy at Berkeley Law at the University of California, Berkeley. Arianna's research interests focus on juvenile justice policies and rehabilitation efforts. She is also a research assistant in Dr. Steven Hinshaw's laboratory in the Psychology Department at the University of California, Berkeley, where she is examining the correlation between prenatal exposure to toxins and ADHD in children. Arianna works with youth at Juvenile Hall in Marin County, CA and will be pursuing a Ph.D. in Criminology or Clinical Psychology. She received her Bachelor of Arts in Psychology from the University of California, Los Angeles in 2010.