

## DRAFT Working Paper

**Title: Adolescents and Alcohol, What We Don't Know Could Destroy *Them*:**

**New Research for Educators on the Affects of Alcohol on the Developing Adolescent**

### **Brain**

#### **Introduction**

As most educators are aware, adolescence is a unique time of discovery, exploration and independence, a time when an individual moves from childhood to adulthood. This developmental period is accompanied by dramatic biological, psychological and environmental changes, many of which can be overwhelming to the young people experiencing them. Adolescence is also often a time of increased risk taking, experimentation and sensation seeking. It is a time when “an appetite for adventure, a predilection for risks, desire for excitement, and inclination toward passionate action, seems to reach naturally high levels” (Dahl and Hariri 2004).

As adolescents search for their own unique identities, their drive for autonomy and independence is strong, but their skills are often lacking. Sexual urges, often not experienced before, accompany the rush of new hormones produced during puberty. The increased sensation seeking and risk taking that may occur during this time often astonish and frustrate the more mature teachers and parents, who do not know how to respond and assist the young people appropriately. At this same time, peers gain importance, often replacing adults as primary sources of support and information; sadly, much of the information these confidants provide is erroneous and their advice dangerous.

For far too many adolescents, alcohol becomes a new ‘buffer’, a softening agent that ‘helps’ them deal with their new feelings and urges. Few, if any, of these young people, however,

realize just how dangerous this newly found buffer can be. These young people often have no idea how the alcohol they are consuming may affect them on a short or long-term basis (American Medical Association). Adolescents are especially susceptible to alcohol use during periods of transition, when they are moving from elementary to middle school; from middle school to high school; times when their lives are in flux. The adolescent brain is simply not equipped to make high stress decisions under pressure, and certainly not when under the influence of alcohol or other mind altering substances (Giedd, 2004).

The difficulties of transitioning from adolescence to adulthood can be lessened if given appropriate adult support, but the adults must be informed. There is concern that young people are not receiving the level of support or scaffolding they need for successful transitioning into adolescence and adulthood. Many adults lack the understanding necessary to assist these young people in appropriate ways. In the case of alcohol use, there are specific concerns regarding insufficient monitoring of young people and inadequate support for young adolescents who are maturing earlier and encountering increasing risks for alcohol use in diverse ways, including media exposure, disrupted families, and increased alcohol use among at-risk peers.

While many educators are aware of underage drinking's association with short term academic failure and illicit drug use and tobacco use, few realize that alcohol can cause alterations in the structure and function of the developing brain, which continues to mature into the mid to late twenties, and may have consequences reaching far beyond adolescence. Recent research has found that adolescents seem to be in a state of 'neural maturation' and their nervous systems seems to be especially sensitive to, and influenced by alcohol.

Surveys have shown that there are high percentages of adolescents who binge drink. These adolescents are susceptible to the long-term impairment of vital cognitive abilities of learning and memory as well as long-term negative changes occurring in brain structures and functions. We now know that the younger the people are when they first try a drug, the more likely they are to become addicted. Each year of use adds to the risk of physical harm, reduced motivation, and impaired judgment. Even in small doses, alcohol loosens inhibitions and impairs judgment, an especially dangerous combination to those who are coping with major physical, sexual, and emotional changes (De Bellis et al., White & Swartzwelder, 2004).

Any drug that affects thinking is likely to be more harmful during adolescence than later in life. Wisdom about use and abuse, moderation vs. addiction, tolerance and impairment, and about particular risks comes with personal experience, which is unavailable to many adolescents. A relatively common phenomenon is generational forgetting, the idea that each new generation forgets what the previous generation learned about harmful drugs (Chassin et al., 2004).

### **The Adolescent Brain**

The first concrete evidence that extended heavy alcohol use could impair brain structure and function in adolescents came from the University of California – San Diego in 2000 (Brown). Brown, Chief of Psychiatry at VA San Diego Health Care System and a Professor of Psychiatry found several differences in regard to alcohol dependent and

alcohol abstinent teens. Adolescent drinkers scored worse than those who abstained on vocabulary, general information tests, and memory retrieval.

Marisa Siveri, a professor of Psychiatry at Harvard's School Of Medicine reported that the unpleasant physical systems associated with alcohol intoxication and hangover that triggers many adults to stop drinking is experienced far less by adolescents and young adults. Her findings support the notion that the adolescent brain functions quite differently than the adult brain, particularly in its response to alcohol.

The brain undergoes significant changes during adolescence, making it much more susceptible to the damaging effects of alcohol than is the adult brain. Researchers have recently found that the prefrontal cortex, the area of the brain responsible for planning, emotional regulation, working memory and organization goes through a second period of overproduction during puberty (Giedd, 2000). An adolescent's ability to plan, reflect, analyze and decide occurs because of maturation of the prefrontal cortex, however, two new neurological developments make emotional excitement more attractive and logical thought more elusive during adolescence.

A developmental sequence in brain maturation means that some parts grow more quickly than others. The limbic system, centered in the lower rear of the brain, which includes the hippocampus and amygdale, reaches full maturation before the prefrontal cortex (Compas, 2004). The limbic system predominates in quick emotional reactions –sudden anger, joy, fear, despair, while the prefrontal cortex coordinates, inhibits, and strategizes. This asynchronous maturation puts adolescents 'at increased risk for emotional problems

and disorders because the brain systems that activate emotions...are developed before the capacity for volitional, effortful control of these emotions is fully in place” (Compas, 2004, 283).

The maturing limbic system is particularly attuned to strong, immediate sensations, yet unchecked by the prefrontal cortex. Again, explaining why “Adolescents like intensity, excitement and arousal. They are drawn to music videos that shock and bombard the senses. Teenagers flock to horror and slasher movies. They dominate queues waiting to ride the high-adrenaline rides at amusement parks. Adolescence is a time when sex, drugs, very loud music, and other high-stimulation experiences take on great appeal.” (Dahl, 2004, 7, 8)

Steady drinking impairs memory and self-control by damaging the hippocampus and prefrontal cortex (De Bellis et al., 2000; White & Swartzwelder, 2004). The American Medical Association reports that the hippocampus, a part of the limbic system which handles many types of memory and learning is actually most susceptible to alcohol related brain damage in adolescents, finding that teens who had been drinking more and for longer had ten percent smaller hippocampi. The Association found that severe changes can occur in the prefrontal cortex as well. Underage alcohol consumption in the U. S. is a widespread and persistent public health concern that creates serious personal, social and economic consequences.

The intent of the Surgeon General’s 2007 “*Call to Action*” was to focus national attention on this problem. The report summarized research showing that young people

who start drinking before the age of 15 are five times more likely to have alcohol-related problems later in life. The availability of this research provides more reasons than ever before for parents and other adults to protect the health and safety of our nation's children. The 2005 National Survey on Drug Use and Health estimates that of the 11 million underage drinkers in the United States nearly 7.2 million are considered binge drinkers and more than two million are classified as heavy drinkers. Underage alcohol use is a pervasive problem with serious biosocial consequences. The nature and gravity of the problem is best described in terms of the number of children and adolescents who drink, along with the resultant negative consequences.

### **Prevalence of Underage Alcohol Use and Abuse**

- Approximately 10 percent of children start drinking before the age of 9-10 (Donovan et al. 2004).
- Nearly one third of youth begin drinking before age 13 (Grunbaum et al. 2004)
- More than one tenth of 12 or 13 year olds and over one third of 14 or 15 year olds reported alcohol use (a whole drink) in the past year (SAMHSA 2006)
- The peak years of alcohol initiation are 7<sup>th</sup> and 8<sup>th</sup> grades (Fadenm 2006)  
Even so, the research clearly indicates that alcohol use and abuse is starting much earlier than in past years (AMA)
- 11 million minors use alcohol; 7.2 million are binge drinkers; more than 2 million are classified as heavy drinkers (AMA)
- Young people who start drinking before 15 are 5 times more likely to have alcohol related problems later in life (AMA)
- Underage drinking is a risk factors for heavy drinking later in life (Hawkins et al, 1997; Schulenberg et al 1996)
- The average age of a child's first drink is 12; nearly 20% of 12 - 20 year olds are considered binge drinkers

- While many believe that underage drinking is inevitable and that adolescents can easily recover because their bodies are more resilient, the exact opposite is true (Hingson)
- Delaying the age of onset of first alcohol use as long as possible would improve some of the negative consequences associated with underage alcohol consumption (Hingson)

Although considerable attention in past years has focused on the serious consequences of underage drinking and driving, the range of adverse consequences is much more extensive and should be comprehensively addressed.

**The negative consequences of underage alcohol use and abuse include the following:**

Children and adolescents who drink:

- Are more likely to fall behind in their studies
- Are more likely to score worse than nonusers on vocabulary, general information, memory and memory retrieval
- Experience problems with verbal and nonverbal information recall, with a ten percent performance decrease
- Experience disruption in their sleep cycle, resulting in impaired learning and memory
- Have increased incidence of Cancer, Cirrhosis of the liver, stroke (Alcohol Research and Health, 2001)
- Approximately 40% of individuals who report drinking before age 15 also describe their behavior and drinking at some point in their lives in ways consistent with a diagnosis of alcohol dependence; 4 times as high as those who do not drink before 21 (Grant and Dawson, 1997)
- Those who drink before 15 are more likely than those who start drinking later in life to have substance abuse problems (Hawkins et al, 1997; Robins and Przybeck, 1985; Schulenberg, 1996). This is the case for individuals from families both with and without family history of alcohol dependence (Hingson et al, 2000, 2001, 2002).

- Children of alcoholics (COA's) are especially vulnerable to alcohol use disorders, COAs are between 4 and 10 times more likely to become alcoholics than those without alcoholic adults (Russell, 1990)
- Experience increased risks of social problems, depression, suicidal thoughts and violence
- Exhibit risky sexual behavior including: unintended and unprotected sexual activity and/or Sex with multiple partners
- Increased risk of unplanned pregnancy
- Fetal alcohol spectrum disorders, which remains a leading cause of mental retardation (Jones and Smith, 1973).
- Release of hormones necessary for growth and maturation (AMA)
- Increased risk of stroke (AMA)
- Significant neuropsychological deficits

**Second hand effects that can put others at risk:**

- Underage drinking is a leading contributor to death from injuries, which are the main cause of death for adolescents
- Death of innocent parties (45% of people who die in car crashes involving a drunk driver under the age of 21 are people other than the driver) -US Department of Transportation, 2004

It is clear from the research that the brain is much more malleable than once thought.

Important structural changes are taking place well into adolescence and beyond. Recent research also suggests that adolescent alcohol use has the potential to trigger short term and long term biological changes that may alter later neurological development as well as immediate behavior. The brain research included in this presentation adds new dimensions to our understanding of adolescence – a time of both increased opportunity and risk.