

Reducing Binge Drinking Among College Students

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Abstract

The purpose of this study was to examine the impact of participating 16-week semester-long challenge ropes course program on decreasing the prevalence of substance abuse, reckless driving, and sexual promiscuity among college students. These negative risk-taking behaviors were evaluated due to their ramifications on a student's development and impacts college campus culture. Due to the interplay of risk and developmental growth known to be part of challenge ropes course programs, it was selected as the treatment in this study. The study showed a decrease in binge drinking and marijuana use in the treatment group.

Literature Review

"I would there were no age between sixteen and three-and-twenty, or that youth would sleep out the rest; for there is nothing in the between but getting wenches with child, wronging the ancientry, stealing, fighting--Hark you now! Would any but these boiled brains of nineteen and two-and-twenty hunt this weather?" (William Shakespeare, *Winter's Tale*, Act 3, Scene 3)

It has long been recognized that adolescence and young adulthood is the age at which people are most likely to get into trouble, and their brains do not operate in quite the same way as an adult's (Anderson, 2015). An increase in risk-taking behavior in this stage of life is strongly influenced by changes that occur in the brain during the transition to full adulthood. The genetic development of the brain in turn is also influenced by environmental factors such as social stress and pressure, sleep habits, violence, and exposure to drugs and alcohol (Chamberlain, 2009). To mitigate the worst excesses of adolescent risk-taking, these factors must be examined in aggregate to determine effective methods of treatment for substance abuse, recklessness, unsafe sexual activity, and other detrimental behaviors.

Brain Development Overview.

The maturation process does not occur evenly throughout the brain at a steady rate through adolescence, but rather in stages in different parts of the brain at different times (Wetherill & Tapert, 2012). Neither does the brain mature in exactly the same way between males and females, as the brain responds to male and female hormones in different ways as puberty progresses (Chamberlain, 2009). In the "nurture vs. nature" debate, these changes form the nature-driven side of the equation for explaining increased risk-taking behavior, and must be understood before the effects of nurture can be considered.

The earliest areas of the brain to develop are the lower regions, the brainstem and the mid-brain, which control basic body functions such as regulating body temperature and blood pressure, and are often referred to as the “survival brain” (Chamberlain, 2009). The upper brain, consisting of the cerebral cortex and the limbic system, develops later, and the cortex is not thought to be fully mature until the mid-20s (Willoughby et al., 2013). The limbic system is primarily responsible for memory and emotion, and consists of the hippocampus, the amygdala, and the hypothalamus, while the prefrontal cortex, located right behind the forehead, is the seat of the intellect, controlling reason, logic, and rational thought (Chamberlain, 2009). The cerebellum primarily controls movement, but also plays a part in recognizing social cues, and is the last part of the brain to mature (Anderson, 2015).

The different maturation rates cause teens to process information differently than adults do. While adults rely primarily on the mature frontal lobes—reason and language—to respond to situations, adolescents are more reliant on the limbic system, particularly the amygdala, and thus more likely to respond emotionally to similar stimuli. The amygdala and the hypothalamus are involved in the body’s response to fear and danger, and reliance on this part of the brain over the cortex also predisposes teens to react more quickly without considering the consequences of their actions. The hippocampus, which helps to transfer information to long-term memory and is strongly associated with facilitating social interaction, is sensitive to estrogen and grows faster and larger in young women, whereas the amygdala and hypothalamus are sensitive to male sex hormones and grow faster in young men. This may help explain why young men have a more action-oriented response to stress and excitement, whereas young women are more likely to excel at social response (Chamberlain, 2009).

The prefrontal cortex matures over a long period of time, starting with a thickening stage around 9 or 10 years of age, followed by a long pruning process wherein the brain generates new connections in response to experiences and eliminates connections that go unused (Chamberlain, 2009). This process lasts until about age 25 (Anderson, 2015). The brain develops its final layer of insulation during adolescence, depositing myelin on critical connections to increase the speed of chemical and electrical message transmission; the prefrontal cortex is the last region of the brain to complete myelination. Myelinated axons form the white matter in the cortex, while gray matter is made up of cell bodies. Male brains tend to have higher proportions of white matter, associated with spatial and numerical processing, while females have higher proportions of gray matter, associated with greater verbal skill and ability to multi-task. While teens have a high capacity for learning and memorizing new information, the late development of the cortex means they have trouble with deliberative thought, such as prioritizing tasks, organizing information, and expressing their feelings effectively. The late development of the cerebellum also creates difficulty with interpreting emotional signals, from themselves as well as others; for instance, confusing anger with sadness (Chamberlain, 2009).

Chemical changes in the brain during development also affect behavior. Serotonin and dopamine levels vary more in adolescents than adults. Taking risks can elevate levels of dopamine, the “feel-good” chemical. When combined with all other brain changes that incline adolescents toward rash behavior, this creates a “high” when taking risks that may only encourage it further. During puberty, the sleep hormone melatonin also begins to release later at night and linger longer in the morning, keeping teens awake into the night and sluggish in the morning. Deep sleep (known as slow wave sleep) may decrease by as much as 40% during adolescence. The end result is that teens need substantially more sleep than adults to help them adjust to all the changes in their brains (Chamberlain, 2009).

Assessing Behavioral Changes, or How Bad Is It Really?

While it may be unquestioned that risk-taking behavior increases during adolescence, it is important to step back for a moment and understand the nature of that increase. How much of an increase is it, and just how risky is the behavior in question? Is adolescence really the worst time? How much of it is intentional, and how much not? Do adults really take less risk, or just different kinds of risk? Answering these questions helps to provide context for approaches to reduce the most dangerous forms of adolescent behavior.

The easiest way to assess risk increase is to look at mortality and injury statistics. According to Willoughby et.al. in the U.S. and Canada, the difference in overall deaths between the 10-14 and 15-19 age ranges increases from an average of 5.85 per 100,000 to 36 per 100,000 according to studies in 2005 and 2009. Though that increase appears significant, it still means that the survival rate of high school students in these two countries is a very impressive 99.96% (2013). The death rate continues to rise in young adulthood as well, indicating that the increase is not unique to adolescence. Similarly, unintentional injuries are also indicative of risky behavior.

In the U.S. in 2005, the rate of injuries requiring hospital treatment in 10-14-year-olds per 100,000 was 11.23%, versus 14.49% for 15-19-year-olds. However, this is the same age range at which many adolescents are first exposed to organized sports, driving, and employment—all potentially hazardous, but not the kind of risk that society frowns upon (Willoughby et al., 2013). Given these numbers, it is clear that youths still manage to go through adolescence without any major problems, and it is important not to exaggerate the health risks that they face.

Brain development studies show a disparity between the early-developing emotional centers of the brain and the later-developing logical control centers, and these would indicate that the time of life with the greatest need for sensation and the least available self-control would be middle adolescence, roughly around age 15 (Willoughby et al., 2013). Does this peak of vulnerability actually correlate with the highest level of risk-taking behavior though? Longitudinal studies indicate that answer might be no. A survey of grade 9-12 students showed that rates of alcohol consumption, smoking, drug use, and delinquency increased gradually during the high school years to a maximum in grade 12 (age 17-18), rather than peaking around middle adolescence. Furthermore, researchers find that the highest level of risk taking behavior consistently occurs in young adults of college age, with the most favorable attitudes toward risk occurring at ages 20 and 21, particularly with respect to alcohol use (Willoughby et al., 2013). Paradoxically, future college students who take less risk in high school than their non-college-bound peers go on to surpass them once they enter the university. Data from the U.S. and Canada also show notable declines in alcohol and drug use among high school students since the 1970s, which correlates with aggressive public campaigns against these behaviors during the ensuing decades. These discrepancies suggest that social environment may outweigh biology in determining vulnerability to risky behavior (Willoughby et al., 2013).

A common assumption of adolescent studies is that risk taking is an impulsive behavior resulting from a lack of self-control. Social context, however, complicates that assumption. Social rewards such as group acceptance and romantic success often lead to deliberate risk taking to attain them. Planned risk taking may even require teens to exert self-control to overcome fear of negative consequences or aversion to taste and smell (Willoughby et al., 2013). Adolescents who show greater expectation of social benefits from alcohol consumption demonstrate greater frequency of consumption than those with lower expectations, and students who dislike alcohol, but believe their friends enjoy it, are more likely to drink anyway than those who believe their friends dislike alcohol as well. Unfortunately, there is little existing data to determine whether adolescent risk behavior is more likely to be planned, unplanned, or a combination of both (such as planned drinking, but unplanned drunkenness) (Willoughby et al., 2013).

Challenge Ropes Courses.

Adventure education concepts have developed foundational beliefs that target the needs of students at all ages. As more is learned about the adolescent brain, people are becoming more aware of these core values making a strong connection to the direct developmental needs of teens. Activities involving challenge courses, adventure programming, and wilderness therapy are all proven programs that provide strong benefits for participants. Typically, the benefits evaluated are self-esteem, communication, leadership, and team building (Terry, 2002). The umbrella that covers challenge courses, adventure programming is the foundational concept of experiential education. The ever growing and successful program of Outward Bound was created by Kurt Hahn and built on 'Four Pillars', which include "physical fitness, an expedition that provides challenge and adventure, a project that develops self-reliance and self-discipline, and a sense of compassion through service" (Outward Bound, 2004). It is essential in adventure education that the participants are learning by doing, that there is a relationship between teacher and student, and that students are working within the zone of disequilibrium for optimal learning to occur (Itin, 1999; Nadler & Luckner, 1992). This process of learning allows the student or participant to be fully engaged in the present where it is safe to question previous beliefs, habits and formulate new knowledge and understanding with fresh perspectives.

Research on adventure education repeatedly demonstrates an increase in internal locus of control and decrease in external locus of control (Cross, 2002, Hans, 2000). It is logical to think with an increase of internal locus of control one would tend to make healthier decisions.

A key element in adventure education is taking the time to reflect and debrief experiences. This process allows for students to use the experience they just had to ignite connections to the 'real world' and their personal situations.

The learning cycle involved in experiential learning typically comprises; experience, reflection, processing and application (Nadler & Luckner, 1992). It is in the reflection and processing stages that metaphors and small group discussions with debriefings occur. This part of the program is critical, it is this stage where the knowledge gained is bridged to future behaviors.

Methodology & Results

Purpose.

The purpose of this study was to explore the three main areas of adolescent risk taking (substance abuse, reckless driving, and sexual promiscuity), and ascertain if semester long class, taught on a challenge ropes course, focusing on personal and social responsibility, mindfulness, and social justice would have mitigating effects on any of the identified areas. Utilizing challenge course as the treatment in this research was an intentional decision, due to the interplay of risk and personal development known to be part of challenge course programs.

This study was a pretest posttest design, with the participants in both the control group and the treatment group completed a 10-question survey inquiring about their habits in the following areas: substance abuse, reckless driving, and sexual promiscuity.

Participants.

The participants in this study were self-selected from two different courses taught in the Kinesiology Department (KINE) at the California State University, Chico (CSUC). The control group were students enrolled in KINE 247 World Sport and Games and the treatment group were enrolled in KINE 222 Challenge Quest. Both classes are electives containing students from first year to seniors. KINE 222 Challenge Quest is a 3-credit course taught exclusively on the university's challenge ropes course. The class meets 2 times per week for 2 hours each time, for 16 weeks which equates to 64 contact hours. The purpose of the class is to teach personal and social responsibility through adventure education, using experiential education teaching methods. (Chico State, 2016). KINE 247 World Sport and Games is a 3-credit course and has the same meeting pattern as KINE 222. The focus of KINE 247 is understanding how sports are integrated into society's cultures around the world. (Chico State, 2016).

The control group consisted of 84 students, (71% female, 29% male) and the treatment group consisted of 33 students (48% female, 52% male); with ages ranging from 18-26 years old. The data were collected in the first 20 minutes of class on the first day after the university drop date had passed. Participants filled out paper forms and the data was collated manually. At the end of the semester during the week prior to final exams the questionnaire was administered in the exact same way.

Instrument

The instrument was a modification of the Youth Risk Behavior Surveillance System. (YRBSS), developed by the Center for the Disease Control and Prevention (CDC). The YRBSS was developed by the CDC to monitor the trends of "six priority health-risk behaviors among youth" (CDC, 2004, p. 3). The six categories include behaviors contributing to unintentional injuries and violence, tobacco use, alcohol and other drug use, sexual behaviors, dietary behaviors, and physical habits. While all six categories were worth investigation, it was the intention of this study to evaluate the risk-taking behavior and possible change of behavior surrounding the categories of unintentional injuries common on many college campuses (through driving drunk habits), sexual experiences, binge drinking and other drug use. Binge drinking is defined as heavy episodic drinking with the intention of becoming intoxicated by heavy alcohol consumption of alcohol over a short period of time (Renaud, 2001). Finding a similar definition of marijuana use was not as forthright so for this study it was considered using marijuana more than 5 times in thirty days.

Ten Questions were selected to represent these areas. After the collection of the initial data the two groups were compared using a Pearson chi-squared test to see if there ascertain if the control group and treatment group were similar. There were no significant differences in the groups prior to treatment (data not provided). After treatment, a Pearson Chi-squared (X^2) was calculated in each area. Chi-squared tests goodness of fit, homogeneity and independence, a null hypothesis was proposed for each area of risk (Glass & Hopkins, 1995). The generalized results are:

Reckless driving: no change with either the control group or treatment group.

Sexual behavior: no change with either the control group or treatment group

Binge Drinking: significant decrease in treatment group, no change in Control group

Marijuana use: significant decrease in treatment group, no change in control group.

The following are the tables representing the results of the two areas that proved to be significant. Table 1 compares the pre-test and the posttest with the treatment group as it relates to binge drinking. Table 2 compares the pre-test and posttest of the treatment group as it relates to marijuana use.

Table 1 Binge Drinking

The contingency table below provides the following information: the observed cell totals, (the expected cell totals, and [the chi-square statistic for each cell].

	No Drinking or Social Drinking	Binge Drinking	Marginal Row Totals
Pretest	11 (16) [1.56]	55 (50) [0.5]	66
Post test	21 (16) [1.56]	45 (50) [0.5]	66
Marginal Totals	32	100	132 (Grand Total)

The chi-square statistic is 4.125. The p -value is .042254. This result is significant at $p < .05$.

Table 2 Marijuana Use

The contingency table below provides the following information: the observed cell totals, (the expected cell totals, and [the chi-square statistic for each cell].

	Little or no marijuana use	Heavy marijuana use	Marginal Row Totals
Pretest	10 (15.5) [1.95]	23 (17.5) [1.73]	33
Post test	21 (15.5) [1.95]	12 (17.5) [1.73]	33
Marginal Totals	31	35	66 (Grand Total)

The chi-square statistic is 7.3604. The p -value is .006668. This result is significant at $p < .05$.

Conclusion

This study is significant for colleges and universities across the nation. More than 1,800 students die each year from alcohol related issues; additionally, over 600,000 students per year are injured in drinking related incidents. (McMurtrie, 2014). According to the National Institute for Alcohol Abuse and Alcoholism 25% of students report that their academic performance suffered from drinking (NIA, 2015). Additionally, 696,000 college students report being assaulted by another student that had been drinking, and over 97,000 students report alcohol related sexual assaults (2015). Nationally, 70% of college students report engaging in binge drinking (CDC 2012). First-year students are exceptionally vulnerable in the first 6 weeks of their first semester (NIA, 2015).

The findings in this study mirror those found by Amy Conroy (2011) in an unpublished Master's Thesis. The main difference between the two studies was the current one used a pretest posttest design and compared the control group with the treatment group to ascertain if there already existed a difference in the two groups. Conroy's study was unique in that it had a larger treatment group that consisted of similar courses taught on two different campuses. Conroy used classes on the University of Northern Colorado Campus that were similar in design, structure, and curriculum.

Successful and award-winning intervention programs are multi-faceted and have comprehensive education and prevention programs (USDOE, 2008). A significant ropes course experience where the focus is on personal and social responsibility, mindfulness and sense of belonging would add to the existing measures used to prevent drug and alcohol abuse. A significant experience means 30-45 contact hours, not a 1-2-hour experience. Requiring all first-year students to have a ropes course class in their first six weeks could be incredibly positive during that critical period.

The curriculum for KINE 222 focuses on personal and social responsibility, mindfulness and sense of belonging. The curriculum never specifically focuses on drinking, drug use or reckless behavior; however, the class had a significant impact on the reduction of binge drinking and marijuana. A required ropes course class as a general education elective would be a straightforward way for a university to mitigate some of the expenses and tragedy of alcohol and drug abuse.

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