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Roger Gregush April 4, 2011

Anabolic Steroid Use and Violence among Athletes and across Gender

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Abstract

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Studies that have examined the link between anabolic steroids and violence in the past have yielded mixed results. Some studies have found anabolic steroid usage to be associated with increased aggression and an increased likelihood of engaging in violence, while others have not. This study examines whether anabolic steroids are more likely to cause some types of people to engage in violence than others. Specifically, it looks at how athletic participation and gender impact a steroid user's likelihood of engaging in violence. Cross tabulations were used to analyze measures of violence, steroid use, athletic participation, and gender from data in the "Monitoring the Future Survey" from 2009. The results indicated that athletic participation did not influence a steroid user's likelihood of engaging in violence. However, male steroid users were more likely to be violent than female steroid users. These findings suggest that some steroid users may be more likely to engage in violence than others.

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Introduction

The use of anabolic steroids to achieve significant gains in muscle mass, acquire a competitive edge in athletics, and alter physical appearance is condemned by many in contemporary society. Aside from the ethical concerns surrounding the use of anabolic steroids, a range of detrimental physiological and psychological side effects may occur. Anabolic steroids have been found to be associated with increased aggression, irritability, maniacal behavior, suicidal thoughts, severe depression, and paranoia (Pope & Katz, 1994). "Roid Rage" is another common side effect associated with the use of anabolic steroids, which can be explained as random fits of uncontrollable anger and rage. Side effects experienced by steroid users would likely have an impact on their tendency to engage in various forms of crime, especially violent crime. The findings from past studies that have examined the relationship between anabolic steroid use and violence have rendered mixed results. However, results from many studies have indicated that there is a possible correlation between anabolic steroid use and an increased likelihood of aggression and violence (Isacsson, Garle, Ljung, Asgard & Bergman, 1998; Klotz, Garle, Granath & Thiblin, 2006; Pedersen, Wichstrom & Blekesaune, 2001; Pope & Katz, 1994). Anabolic steroid users may also be more likely to have a pre-meditated component to their involvement in violent crime versus users of various other drugs that may resort to the use of violence because of unforeseen situational circumstances that may arise while committing a nonviolent crime (Klotz et al., 2006). Circumstances such as the victim fighting back, the failure of the victim to cooperate, being seen by the police, and other unexpected events may cause an offender to engage in violence. Anabolic steroid users are more likely to experience serious psychological side effects from the drugs that may increase the likelihood of pre-meditated violence (Pope & Katz, 1994). However, the increased aggression attributed to the

"roid rage" experienced by some steroid users contradicts a pre-meditated component to violence. Therefore, it may be the case that a combination of sudden uncontrollable "roid rage" with pre-meditation, caused by psychological side effects attributed to anabolic steroids, are most likely to influence a steroid user to engage in violence.

The increased susceptibility to "roid rage" combined with other psychological effects such as hypomania and severe mood swings, commonly reported by steroid users, would lead one to believe that an increase in hostile, violent crimes is likely to result from anabolic steroid usage. The primary question that will be examined in this research study is whether users of anabolic steroids are more likely to commit violent crimes than non-users. A second focus will be on whether athletic participation and gender influence the effect of anabolic steroid use on violence. Mixed findings from previous studies on anabolic steroid use and violence indicate that some steroid users may be more prone to violence than others. Anabolic steroid users who engage in violent sports such as football, rugby, boxing, hockey, and mixed martial arts may be more likely to become aggressive and violent. The reasoning behind this is that sports like these tend to have a more rigid adherence to hyper-masculine values and ideals that are promoted by the male athletic subculture associated with them. Therefore, a steroid user's belief and adherence to machismo attitudes promoted by the male athletic subculture is likely to significantly impact their likelihood of engaging in violence. A significant gender gap exists in the likelihood of engaging in crime. Males are both more likely to offend and are significantly more likely to engage in serious violent crime than females (Agnew, 2009, p. 70). Males are also more likely to be socialized to use physical aggression in confrontational situations than females (Maccoby, 1990; Underwood, 2003). Males also have naturally higher testosterone levels, which may be correlated with a higher tendency to become aggressive (Choi, Parrott &

Cowan, 1990). These factors are likely to contribute to a difference in the level of violence between male and female steroid users.

The following questions will be investigated in this study: Are steroid users more violent? Are athletes who use anabolic steroids more prone to violent crime? Are male steroid users more likely to become violent than female steroid users? The principal hypotheses of this study are that athletes that use anabolic steroids will be more likely to engage in violence than non-athletes and that male steroid users will be more violent than female steroid users. These hypotheses will be tested by creating percentage tables with data from the "Monitoring the Future Survey" for 2009, administered by the University of Michigan to high school students all across the nation.

This research study deals with a very important issue in modern society. Anabolic steroids have the capacity to significantly alter physical strength, speed, and appearance (National Institute on Drug Abuse [NIDA], 2006). In a society that is obsessed with looks and appearances, an increased emphasis has been placed on the male body, and an increasing number of men are turning to steroids. However, the majority of consumers do not realize the full consequences and impacts of anabolic steroid use on the individual or on society as a whole. Finding a correlation between anabolic steroid use and an increase in instances of violent crime could help deter individuals from using these hormones for non-medical purposes. Specifically, if athletes who use anabolic steroids are found to have a higher likelihood of engaging in violence than non-athlete steroid users, then this might persuade athletes not to use steroids. Athletes may become less likely to use steroids because of an increased fear of potential repercussions that may result from the use of anabolic steroids. If male steroid users are found to be more violent than female steroid users, then males will be better informed about the potential

consequences that could result from their steroid use and less likely to risk using steroids in the first place. The results of this study may encourage society to more efficiently deal with the illegal distribution and sale of anabolic steroids. Steroid testing may more actively be implemented in sports, especially on the high school level where testing is minimal and teenage athletes are first exposed to steroids.

This study differs from previous studies on anabolic steroid use and crime because the specific impact of athletic participation and gender on steroid use and violence has not yet been thoroughly investigated. The results of this study will help to broaden the general knowledge between anabolic steroid use and violence, as well as provide a more detailed explanation for the potential increase in violence that athlete steroid users may experience compared to non-athlete users and male steroid users may experience compared to female steroid users. This study will begin with a literature review of the general background on drug use and crime. A general background will follow this on the history of steroids and some of the common side effects associated with their use. The next section is a literature review of prior studies examining the association between anabolic steroids and violence. A section on theory and hypotheses will follow this, which is broken down into subsections of athletic participation, gender, and hypotheses. A data and methods section that describes the secondary data set used and the methodological procedure follows this. The results of the study are then presented, followed by a discussion section.

Literature Review

General Links between Drugs and Crime

Prior studies examining the effects of drugs on crime have indicated that drug use is frequently associated with crime. The sale, possession, distribution, and use of drugs for non-

medicinal purposes such as cocaine, marijuana, heroin, and amphetamines is classified as a crime in and of it self (Timrots, 1994, p.1). Several studies have found that drug use is quite common among criminals (Timrots, 1994; Goldstein, Brownstein & Ryan, 1992; Prichard & Payne, 2005). The Drug Use Forecasting Program operated by the National Institute of Justice uses urine samples from arrested individuals to determine the percentage of people who test positive for drugs during arrest. Data on arrested individuals that were collected across twenty-four different cities in the United States indicated that between forty two to seventy nine percent of males and between thirty eight to eighty five percent of females tested positive for drugs (Timrots, 1994, p.2). In a study conducted by the Australian Institute of Criminology in 2001, three hundred and seventy one juveniles confined in detention centers across all Australian jurisdictions between the ages of ten and seventeen were interviewed with the intent of investigating the influence of their drug use on their criminal careers. This study found that seventy percent of offenders were under the influence of drugs while committing their most recent criminal offense. Of those who admitted to actively using drugs during their latest crime, seventy nine percent said that they were using marijuana and thirty-nine percent claimed that they were under the influence of amphetamines (Prichard & Payne, 2005, p. xi). The findings of these studies indicate that a significant portion of individuals who are arrested committed their crime while being under the influence of drugs. Self-report data collected from the National Household Survey on Drug Abuse in 1991 indicated that 26.1% of males between the ages of eighteen and forty-nine committed a violent crime while under the influence of alcohol, marijuana, or cocaine and 24.7 percent committed a property crime. Of those respondents who did not use drugs, only 2.7 percent reported committing a violent crime and 1.7 percent admitted

to having committed a property crime (Timrots, 1994, p.1). These results support the argument that drug users are more likely to engage in crime than nonusers in the general population.

However, the fact that a high percentage of criminals use drugs does not mean that drug use causes crime. The association could be due to an unforeseen third variable. Several third variables such as delinquent peer association, low self- control, and irritability have been associated with delinquency in the past, and it is possible that a causally prior third variable could be responsible for the link between drug use and crime. Also, since causal order is not determined, this finding could suggest that engaging in crime leads to an increased likelihood of using drugs. Longitudinal studies conducted on the same sample of subjects over time are the most effective at establishing causality. Yet, prior studies that have controlled for third variables associated with crime and taken into account causal order have still found that drug use is related to crime (Goldstein et al., 1992; Prichard & Payne, 2005; Reed & Rountree, 1997).

A variety of theories and explanations have been proposed in the past in an effort to explain the link between drugs and crime. One potentially significant and major reason for the increased criminality commonly found amongst illicit drug users pertains to the pharmacological and physiological side effects associated with the use of drugs (Agnew, 2009). Drugs, such as cocaine, methamphetamines, heroin, and PCP can cause the user to experience extreme sensations of euphoria that can temporarily overcome logical reasoning and rational thought. Different classes of drugs may vary slightly in the pharmacological and physiological side effects that they inflict on the user. The most common side effects associated with the use of several illicit drugs, including cocaine, heroin, methamphetamine, morphine, and marijuana are irritability, insomnia, aggression, anxiety, depression, paranoia, psychosis, memory loss, distorted sense of perception, increased heart rate, and tremors (Spiess, 2003, pgs. 3-4).

However, it should be noted that not all drugs cause these side effects and that side effects can vary significantly by the specific drug. Users of these illegal substances may also experience feelings of invincibility, an inability to sense pain, hallucinations, as well as suicidal thoughts and visions (Drug Rehab Advice Center, n.d.).

From the perspective of control theory, the level of self-control may temporarily be reduced while under the influence of these substances and psychological restraints to crime may also be suppressed. The pharmacological side effects associated with these drugs may therefore temporarily alter certain personality traits that can increase the likelihood of engaging in crime. Specifically, a decrease in self-control combined with an increase in irritability may result. These drug induced physiological effects are likely to decrease an offender's awareness of the potential costs and risks associated with crime. An offender may also become more likely to respond to provocation with violence and display a more aggressive demeanor when interacting with others (Agnew, 2009).

Another major proposed link between drug use and crime is financial motivation. Withdrawal from certain highly addictive drugs such as heroine and crack can often cause extreme feelings of anxiety and depression (Agnew, 2009). Side effects associated with withdrawal along with a longing to experience the euphoric effects induced by the drug can be a significant motivational factor to engage in crime in order to obtain the financial means necessary to be able to purchase more of the desired substance. Several different forms of property crimes are often committed in order to satisfy an offender's craving for a drug. The most common types of property crimes committed with a financial motivation include larceny, burglary, robbery, prostitution, and drug sales (Agnew, 2009). Based on a study conducted by the Bureau of Justice Statistics in 1991, ten percent of Federal prison inmates and seventeen

percent of State prison inmates admitted to committing their crimes in order to obtain money to purchase drugs. The inmates that were incarcerated for robbery, burglary, larceny, and drug trafficking were most likely to admit to having a financial motivation in order to satisfy their desire for a drug when they committed their offenses (Timrots, 1994, p. 9). One of the strongest predictors of an offender's decision to engage in crime can be traced back to his or her initial impulse to acquire a drug (Goldstein et al., 1992). Also, in the study mentioned previously by the Australian Institute of Criminology, forty four percent of juveniles who committed burglaries claimed that their primary motivation for the crime was a need to obtain money in order to be able to purchase drugs (Prichard & Payne, 2005, p. xi). Collectively, prior literature indicates that the desire to obtain the financial resources necessary to acquire more of a desired drug is a strong motivational factor involved in the decision to engage in various forms of property crime.

Drug use has been found to be more commonly associated with property crime in the past, but it has also played a significant role in violent crime as well. Many individuals who set out to commit a robbery or burglary may not intentionally plan to use violence while committing the crime, but situational circumstances may leave these criminals with no other choice (Spiess & Fallow, 2000). For example, an individual may set out to initially plan and execute a successful burglary. However, the owner of the house may unexpectedly be home and resist the efforts of the offender to burglarize his home. The offender will then resort to violence because of these unforeseen circumstances. Therefore, violence is very often a by-product of a pre-meditated property crime that was initially economically or financially motivated. The need to obtain money can also increase the strain that the individual may be experiencing. This increased strain can also increase the likelihood to engage in violence in order to alleviate this stressor (Agnew, 2009).

The illegality of several illicit substances in the United States has paved the way for the illegal drug trade in America. Drug trafficking results in a significant amount of violence due to the inherent nature of the business. Competition between dealers for territory and customers, disputes between dealers, rip-offs between individuals involved in the drug market, and various other complications frequently result in violence (Spiess & Fallow, 2000). Individuals involved in the drug trafficking market obviously cannot go to the police when business disputes or complications arise. Therefore, violence is used as a viable alternative in order to keep individuals in line. The inability to go to the police combined with an inherent acceptance and adherence to street subculture results in a large amount of crime, particularly violent crime that can be attributed to the drug trade. Areas that are active in the drug trafficking market also tend to be socially and economically disadvantaged, which significantly reduces the likelihood that social and legal controls will decrease the possibility of escalation to violence (Spiess & Fallow, 2000). An increase in the availability and widespread distribution of guns has also helped contribute to an increase in violence associated with the drug trafficking industry. Disputes that may have been settled physically in the past are now more likely to be settled with guns, which therefore increases the possibility of drug-related homicide. A central component of the argument for the legalization of drugs rests in the idea that a legalized drug market would reduce the violence caused by the drug trade. Legalization of the drug market would also significantly drive costs down and therefore reduce the potential profit margin in the black market economy, which would reduce the incentive for illegal drug trafficking (Agnew, 2009).

Habitual drug users and addicts are also more likely to become associated with delinquent peers. During adolescence especially, teenagers have a strong desire to affiliate with others and to be accepted amongst their peers. The pressure to "fit in" frequently leads

adolescents to associate with peer groups that are similar to them. Individuals that display similar behavioral patterns and are like-minded are more likely to reinforce their common behaviors than individuals who do not share common beliefs and values. Associations with individuals who are similar in nature are likely to continue and progress because of the anticipation of potential positive reinforcement in the future (Reed & Rountree, 1997, p. 151). Drug users are frequently exposed to delinquent peers when purchasing drugs as well. Association with delinquent peers also fosters the social learning of crime and significantly increases the likelihood that an individual will engage in crime (Agnew, 2009, p. 282). Differential Association Theory (Sutherland & Cressey, 1970) states that delinquency is a result of learning norms, customs, values, beliefs, attitudes, rationalizations, and motives through personal interaction with significant others (Reed & Rountree, 1997, p. 145). A higher likelihood of associating with delinquent peers would therefore increase the probability of learning and internalizing beliefs conducive to delinquency.

In a survey study conducted by the Missouri Department of Mental Health in 2002, twelve thousand randomly selected sixth, eighth, tenth, and twelfth graders across two hundred and seventy six schools in Missouri responded to questionnaires, which examined their substance abuse patterns. This study found that interaction with delinquent peers was one of the most common risk factors associated with substance abuse (Evans, Novak & Daltro, 2002, p. 63). Social Learning Theory would predict that the association with delinquent peers for routine drug users will increase their likelihood to adapt beliefs favorable to delinquency, increase positive reinforcement for delinquent behaviors, and enhance the probability of imitating delinquent models. All of these factors combined will strengthen the prospect of an individual engaging in crime.

Long-term drug users are also likely to develop weak bonds with conventional others (Agnew, 2009, p. 282). This is likely to decrease an individual's stake in conformity and affect their beliefs about conventional society. A lower stake in conformity decreases the likelihood that an individual will seek to satisfy their goals and desires through standard, conventionally accepted means. This may further increase a person's likelihood to engage in crime. Family rejection resulting from the drug habit as well as the inability to adapt to conventional norms and standards is also likely to increase the level of strain that a person may be experiencing. This increase in strain may further increase the potential for crime. Taken as a whole, chronic drug users are likely to have an increased predisposition to crime because of their decreased bonds with conventional others, smaller stake in conformity, and larger likelihood of association with delinquent peers (Agnew, 2009).

Overall, the prior literature indicates a general association between drug use and an increased susceptibility to crime. Much of the reasoning behind this relation can be applied across various classes of illicit substances. The use of anabolic steroids for non-medicinal purposes is unique because the user does not feel an immediate euphoric "high" that is commonly experienced with the use of other illicit drugs. Anabolic steroid users seek the physical side effects that accompany the use of these substances. The extent to which the general theories explaining the link between drug use and an increased predisposition to engage in crime can be applied to the use of anabolic steroids is uncertain because of the uniqueness of these drugs. Just as with the use of several other illegal substances, the pharmacological and physiological side effects associated with the use of steroids are likely to influence an individual's decision to engage in crime. Steroids can cause increased aggression, irritability, maniacal behavior, severe depression, suicidal thoughts, delusions and paranoia. These side

effects are likely to decrease an individual's level of self-control and lower psychological restraints to crime. The financial motivation to obtain more of a drug in order to experience a feeling of euphoria is not likely to play a role in the motivation behind criminality amongst steroid users. However, financial motivation to obtain steroids for the physical effects associated with the drugs (enhanced muscular growth, increase in speed, and a desirable physique) may influence criminality among steroid users, especially because anabolic steroids are very expensive. An increased likelihood to affiliate with delinquent peers, especially amongst athlete steroid users, is very likely to impact the probability of engaging in crime. Steroids may also decrease informal social control. The side effects associated with steroid use may cause a temporary lapse in rational thought processing and therefore decrease your likelihood of being controlled through internal values, beliefs, and norms. Steroids are likely to have diverse effects across different types of individuals, especially on levels of involvement in violence. I elaborate further on this later on in the paper.

Anabolic Steroids (General Background)

Anabolic steroids are generally defined as the class of synthetically designed drugs that are imitations of the male hormones of testosterone and androgen. Anabolic steroids can promote the growth of skeletal muscle tissue and also exaggerate male sexual characteristics (NIDA, 2006). Anabolic steroids were initially developed in the 1930s to treat hypogonadism. Hypogonadism is a condition found in both males and females in which insufficient amounts of sex hormones are produced by the sex glands. In men, this condition results in the testes producing an inadequate amount of testosterone to maintain normal development, growth, and reproductive capacity. Current medical applications of anabolic steroids include the treatment of the delayed onset of puberty, reversal of musculoskeletal atrophy caused by diseases such as

HIV, and the curing of some forms of impotence (NIDA, 2006). The discovery of the anabolic and androgenic muscle-building capabilities of these drugs soon led to their abuse by bodybuilders and other athletes. Anabolic steroids come in several forms and can be absorbed by the body through different methods. Steroids can be consumed orally through liquids or pills, injected intravenously or intramuscularly, and also applied externally through the skin in the form of creams or gels (NIDA, 2009). Users of anabolic steroids also frequently engage in "stacking" or "cycling". "Stacking" refers to taking multiple different forms of synthetically designed anabolic and androgenic steroids with the belief that these compounds will work together to maximize the amount of size and strength gained by the user. "Cycling" is the process of consuming steroids for a pre-determined time period such as three months and then discontinuing steroid use for some time after. The idea behind "cycling" is that users will minimize the negative physiological and psychological effects associated with anabolic steroid use (NIDA, 2006).

Since the discovery of anabolic steroids and their potential muscle building and physique altering effects, more and more people have experimented with these synthetic hormones. Results from the Monitoring the Future Survey for 2009, indicated that 2.5 percent of twelfth grade males and 0.4 percent of twelfth grade females had used anabolic steroids at some point in their lives. 30.3 percent of twelfth grade respondents also indicated that steroids were very easy to obtain and sixty percent of participants reported having a knowledge of the perceived risks associated with steroid use. The Centers for Disease Control and Prevention administer the Youth Risk Behavior Surveillance Survey every year. Findings from 2007, indicated that four percent of all high students had admitted to using steroids at some point in their lives (NIDA,

2009). The results from these studies suggest that illicit anabolic steroid use is significant amongst young adults and that the barriers to obtaining these drugs are alarmingly low.

The use of anabolic steroids can give athletes an unfair advantage over their competitors and this has become a highly controversial topic in contemporary society. Professional sports organizations such as the NFL, MLB, and NHL have banned the use of anabolic and androgenic steroids among professional athletes. Professional athletic organizations such as these have given much attention to the illicit use of anabolic steroids in recent years and some athletes have jeopardized their careers because of their decision to use anabolic and androgenic steroids. However, the use of anabolic steroids comes with great risks.

Anabolic steroids can have a variety of adverse side effects and can also cause several negative health consequences. Steroids disrupt the normal levels of hormonal production in the body, which can lead to several irreversible physical changes. In men, steroid use can cause: acne, infertility, testicular atrophy, reduced sperm count, male-pattern baldness, and gynecomastia (breast development). Female steroid users may experience excessive growth of body hair, male-pattern baldness, enlargement of the clitoris, decreased breast size and body fat, and deepening of the voice (NIDA, 2006). Anabolic steroids can also lead to several life-threatening medical conditions in both men and women, including increased cholesterol levels, high blood pressure, cardio-vascular disease, premature heart attacks, stroke, liver cancer, development of tumors, and an increased potential of contracting infections (NIDA, 2006). Steroid use is not only severely detrimental to your physical health, but is also associated with a series of negative physiological, mental, and behavioral side effects. Steroids have been shown to cause increased aggression, irritability, maniacal behavior, severe depression, suicidal thoughts, delusions and paranoia (Pope & Katz, 1994).

Despite all the negative health implications associated with anabolic steroid use, many people still choose to use these drugs. The potential gains in strength that can be achieved with steroids drive athletes to consider their use. An increased focus on hyper-masculinity and the physique of men in contemporary society may also potentially influence some individuals to engage in steroid use. The prevalence of anabolic steroid use along with the widespread availability of these drugs has significantly increased over the last two decades (Graham, Davies, Grace, Kicman & Baker, 2008). The increasing popularity of bodybuilding along with a shift towards a greater emphasis on male body image likely contributed to this increase in anabolic steroid use. The increasing usage of anabolic steroids in contemporary society has led researchers to start examining the potential effects that these drugs may have on crime and violence.

Anabolic Steroids and Crime/Violence

Anabolic steroids have been linked to crime and violence in the past. The association between steroids and violence can be related back to many of the reasons why chronic drug use increases the likelihood of engaging in crime. The pharmacological side effects associated with the use of anabolic steroids alone may increase the likelihood of engaging in crime. An increased chance of aggression, irritability, maniacal behavior, severe depression, and paranoia are characteristics that are likely to severely alter an individual's level of self-control (Pope & Katz, 1994). This is likely to disrupt the rational cost-benefit analysis to crime. The potential for an individual to act in an aggressive manner and to respond to aggravation or provocation with violence is also likely to significantly increase because of the side effects associated with steroid use (Agnew, 2009). Crime committed while under the influence of anabolic steroids could also be partially attributed to an economic motivation to obtain more of this desired substance.

However, the financial motivation to acquire more of these drugs is not routed in a desire to experience the euphoric effects caused by these substances, but rather to keep gaining significant amounts of muscle mass and to be able to keep a highly masculine physique. As mentioned previously, violence is frequently a consequence of initially premeditated property crimes. Users of anabolic steroids may also be more likely to become associated with delinquent peers. The use of anabolic and androgenic steroids for non-medicinal purposes is in and of itself illegal. The illegality of steroid use may lead individuals to associate with other habitual drug users who may have a significantly increased probability of engaging in delinquency. Association with delinquent peers will advance the social learning of crime and increase the probability that the individual will engage in crime (Agnew, 2009).

Previous studies that have examined anabolic steroids and violence have primarily employed survey methodology. The researchers in a study conducted on teenagers in Massachusetts set out to test the relationship between anabolic steroid use and high-risk behaviors in adolescence (Middleman, Faulkner, Woods, Emans & Durant, 1995). The Massachusetts Youth Risk Behavior Survey was conducted in 1993 on a random sample of 3,054 high school students. This survey measured the use of anabolic steroids in this sample of teenagers and the extent and type of high-risk behaviors that they had engaged in. Out of the students that participated in the survey, forty-nine percent were male and fifty-one percent were female with a mean age of sixteen. The questionnaire that was administered consisted of eighty-nine multiple choice questions that asked whether the respondent had been involved in any of the following high-risk behaviors: suicidal behaviors, not wearing a seatbelt, riding with a driver that had been drinking alcohol, high-risk sexual behaviors, not wearing a helmet on a motorcycle, fighting, carrying a weapon, or driving after consuming alcohol. 5.7% of the male respondents

and 1.7% of females were steroid users. Findings indicated that anabolic steroid use was associated with all of the other high-risk behaviors. The results of this study suggest that teenage anabolic steroid users in Massachusetts are more likely to be involved in both violent and nonviolent high-risk behaviors than teenagers who had never used steroids (Middleman et al., 1995). The researchers suggested that involvement in these high-risk behaviors might be associated with the physiological and psychological side effects associated with anabolic steroid use, such as irritability, aggressive behavior, and depression. They also proposed that the more violent behavior associated with anabolic steroid use could stem from the "roid rage" commonly experienced by users (Middleman et al., 1995). This study had some limitations, however. The data was analyzed based on information collected through a self-report survey. The survey was administered in school and therefore may have failed to include some of the most high-risk adolescence. The sample of respondents came from one geographic area, which may have also potentially biased the results.

In a study conducted in Norway, researchers aimed to analyze the association between doping agents, particularly anabolic steroids, and involvement in violent behavior as well as experiences of violent victimization among a sample of adolescents (Pederson et al., 2001). A survey was administered to a sample of 10, 828 adolescents in 1996 in Oslo (Pedersen & Skrondal, 1999). The survey was cross-sectional. The sample consisted of 50.8 percent boys and 49.2 percent girls between the ages of fourteen to seventeen. The findings of the study indicated that 2.3 percent of boys and 1.3 percent of girls had used doping agents. 11.5% of adolescents had been offered doping agents at some point in their lives, but refrained from using them. Adolescents who had used doping agents and those who had been exposed to doping agents reported higher levels of violence on all measures that were used to test for this variable

in the survey than those who had not used and were not exposed to doping agents. Exposure to doping agents was defined as being offered anabolic steroids or being around steroid dealers and steroid use was measured as orally or intravenously consuming steroids. The results also showed that exposure to and use of doping agents increased the probability of violent victimization five-fold, from 5.2 percent of those that had no exposure and had not used doping agents to 25.6 percent in those that did (Pederson et al., 2001). This study had several strengths. One of the strengths was that researchers were able to control for third variables. The researchers found that the association between doping agents and an increased tendency to engage in violent behavior and an increased likelihood to experience violent victimization was significantly reduced when there were controls for the confounding variables of delinquent peer association, attachment to family members, use of other drugs, certain socio-demographic characteristics and prior involvement in violence. Also, the attrition rate in the study was five percent, which is very low. This study also had some limitations. The group of adolescents who were not in school when the survey was administered may be those that are most likely to use doping agents. Some of those that had reported using doping agents may not have actually been using anabolic or androgenic steroids. Doping agents were defined as anabolic or androgenic steroids, the male hormone testosterone and its synthetic derivatives, and other less androgenic hormones such as nandrolone. The frequency of the use of doping agents was not measured. Some individuals are likely to have had much higher levels of use than others and this may also affect the findings. Yet, despite these limitations, the results of this study indicated that there is some correlation between anabolic steroid use and involvement in violence and violent victimization.

Anabolic steroids have previously been found to be associated with a range of medical and psychiatric side effects. The researchers in the following study set out to broaden their

knowledge about the specific psychiatric and psychological effects that are experienced by steroid users (Pope & Katz, 1994). Researchers conducted a controlled study of eighty-eight athletes who were using steroids and sixty-eight athletes that were nonusers. A structured clinical interview for DSM-III-R (SCID) was used to assess psychiatric symptoms reported during steroid use cycles and during off cycles. The data were collected through a cross-sectional research design. The subjects were administered the interview, underwent a physical examination, and provided urine samples all at the same time. The data were compiled based upon these three procedures. Of the one hundred and sixty athletes that were willing to participate in the study, eighty-eight were determined to be users, sixty-eight nonusers, and four were excluded because steroid use in their cases was unclear. The findings of this study suggested that anabolic steroid use, especially in large doses may be associated with major mood disorders, including severe depression, mania, and hypomania. These mood disorders were more commonly displayed during steroid use rather than during the off cycle and more common in users than in nonusers (Pope & Katz, 1994). A significant correlation was also found between the size of the dose of steroids that were used every week by participants and the severity and incidence of mood disorders. All of the individuals that reported experiencing manic episodes and psychotic symptoms were classified as high-rate users. This study, however, has some limitations. The study relied on self-reports from athletes who were knowingly using steroids. The study cannot control for any athletic or gymnasium sub cultural influences that may have affected the participants and their behavior. It was difficult to determine the actual dosage and type of steroids used by subjects. The fact that the subjects included in the study openly volunteered to participate could have biased the sample population of steroid users. Finally, several confounding variables such as the use of other drugs, prior personality disorders, and an

increased predisposition to violence and aggression amongst some athletes could have also affected the findings (Pope & Katz, 1994).

Some prior research has indicated that anabolic steroids may also be associated with manic or aggressive side effects. The researchers in this next study set out to analyze the psychological effects of steroids through a randomized, placebo-controlled, cross over laboratory experiment (Pope, Kouri & Hudson, 2000). The researchers selected fifty-six men between the ages of twenty to fifty to be injected with up to six hundred milligrams of testosterone cypionate or a placebo consisting of sesame oil for six weeks followed by six weeks of no treatment. These same men were then exposed to a second treatment, which was the opposite of whatever they had received in the first six weeks, for another six weeks followed by six weeks of no treatment. The study was longitudinal because data were collected at multiple points throughout the experiment. Findings showed that manic scores and the probability of aggression increased significantly during testosterone treatment. However, this effect was not universal among individuals and the response to increased testosterone administration varied greatly. Eighty four percent of the subjects who were administered the highest doses of testosterone cypionate displayed minimal psychiatric effects, twelve percent exhibited mild hypomania, and four percent showed major hypomanic symptoms. Overall, the results indicated that the majority of participants showed little psychological change in aggression or manic symptoms and only a small percent of the subjects displayed prominent effects (Pope et al., 2000). A significant limitation of this study is the small sample size. The crossover design of the study also allows for a potential bias in the results due to a possible carry over effect from the first treatment period to the second. The study did not produce uniformly positive findings and there was no significant correlation between a change in lean body mass and measures of psychiatric

symptoms. Also, the study excluded potential participants who had a history of experiencing psychiatric symptoms. These limitations could have affected the accuracy of the results and therefore undermine the prominence of severe psychological effects that may result from steroid use.

Anabolic steroids have in the past been considered culprits of triggering violent, uncontrollable displays of rage and anger. This suspected correlation has led researchers in this next study to attempt to examine the connection between anabolic steroid use and different forms of crime, particularly violent crime (Klotz et al., 2006). Researchers carried out a controlled retrospective cohort study in Sweden between January 1, 1995 and December 31, 2001 among individuals who were tested for anabolic steroids. The criminal records of those who tested positive were analyzed at multiple points throughout this period and compared to those that did not. Out of the 1,140 individuals who were tested, two hundred and forty one were positive for anabolic steroid use and 1,199 were negative. Comparisons for the relative risk of conviction for different categories of crime between those subjects who tested positive for steroids and those who tested negative revealed that the chance of being convicted of a weapons offense or fraud was higher in the group that tested positive for steroid use. The results indicated that there was no significant difference in the probability of being arrested for violent crimes or crimes against property between those who tested positive for steroids and those who did not. The findings also indicated that steroid use might be associated with an antisocial lifestyle that can involve premeditated criminality. Taken as a whole, this study found no increase in the likelihood of violent crime among steroid users, but there are some limitations that need to be taken into account (Klotz et al., 2006). A large percentage of crimes are not detected and they may account for potential differences in actual level of criminal involvement between steroid users

and non-users. The participants that tested positive for anabolic steroids may not be representative of steroid users as a whole.

The majority of previous literature on anabolic steroid use and violence has focused on the psychiatric, physiological, and pharmacological side effects believed to be associated with the use of these drugs and their likely impact on an increased tendency towards hostility, aggression, and irritability (Klotz et al., 2006; Pope et al., 2000; Pope & Katz, 1994). Little research has been conducted on the effects of anabolic steroids on violence across different types of users. Anabolic steroids are likely to have different impacts on athletes versus non-athletes, males compared to females, and older versus younger users. The type of sport that a steroid user participates in may also play an important role because of the violent nature of some sports.

In a study that took place in the United Kingdom, researchers examined the effects of high doses of anabolic steroids on mood states among male strength athletes that used steroids and male strength athletes that were not steroid users (Choi et al., 1990). The study was longitudinal and researchers used the Profile of Mood States questionnaire, Buss-Durke Hostility Inventory, and Rosenweig Picture Frustration Test to measure levels of hostility and aggression among participants. The athletes were monitored over several months as they went through normal training routines as well as through their competition regiments. Steroid use was determined based on urine analysis. Findings indicated that the athlete steroid users displayed significantly higher levels of aggression and hostility, especially during the "on-cycle" period. The simultaneous use of multiple types of steroids ("stacking") was found to cause the greatest increases in hostility and aggression. Steroid users also reported being more confident and experiencing a feeling of "power". The limitations of this study included: a small sample size, a

non-random sample of participants, and variations in the type of steroids used by the athletes. All of these factors could have potentially impacted the results.

Overall, the findings of previous research studies have indicated a potential correlation between anabolic steroid use and susceptibility to aggression, maniacal episodes, and severe mood swings. Steroids have not only been linked to a variety of negative psychological effects, but also with several potentially detrimental health effects. Prior research has not tried to examine whether steroid use is more likely to result in violence among some types of people than others. Athletic participation and gender are factors that could significantly alter the effects of steroids on individuals. Anabolic steroids may be more likely to lead to violence in athletes than in non-athletes because of the potential influence of the athletic subculture (Pope & Katz, 1994). Male steroid users are likely to be more violent than females that use steroids because of an increased predisposition to violence and aggression that is more common among men. Violence and aggression are frequently used interchangeably, but there are distinctions between the two. Violence is a physical assault against another person with the intent of injuring them or destroying their property. Aggression includes all behavior, physical and psychological, that is intended at injuring another person or destroying their property (Smith, 1983). Some steroid users may be more inclined to aggression and violence than others. In conclusion, the prior literature indicates mixed findings on the association between steroids and violence. Some studies have found a link to violence and others have not.

Theory and Hypotheses

Past studies have indicated that drug use in general is commonly associated with a variety of crimes for several of the reasons described previously. The most comprehensive studies that have been conducted on the effects of anabolic steroid use on violence have focused primarily on

the physiological effects of steroids. Previous studies have found some correlation between steroid use and an increased susceptibility for aggression, hallucination, paranoia, and sudden, unpredictable mood swings (Pope & Katz, 1994). Most studies suggest that steroid use may increase violence, but not all studies support this argument. One possible explanation for the mixed results is that steroid use may be more likely to increase violence among certain groups of users than others. I next argue that steroid use is more likely to increase violence among athletes compared to non-athletes. Also, it is more likely to lead to violence among males than in females. I outline the reasoning behind this assumption in the next two sections.

Athletic Participation

A fairly substantial amount of research has been conducted around the athletic subculture in America, which has been found to be associated with an elevated level of violence, aggression, and an increased risk to engage in various other deviant behaviors (Muir & Seitz, 2004). There are several key ideological components of the athletic subculture that are highly emphasized, especially among male athletes. The acceptance and incorporation of homophobia, misogyny, and the machismo attitude are the central ideas upon which many male collegiate athletic subcultures are based (Muir & Seitz, 2004). Although, the extent of involvement in deviance and violence varies among different individuals within a particular athletic subculture, the central ideological components serve primarily to reaffirm the importance of masculinity and male dominance. These values help to build up the image of toughness and dominance that is highly emphasized among male athletic subcultures. The key ideals of the male athletic subculture also serve to promote the dominance of a strong heterosexual identity combined with male superiority (Muir & Seitz, 2004).

Entrance into the male athletic subculture also tends to be highly ritualistic and tends to focus on several rites of passage that are similar to fraternity initiation. Several of the ritualistic components of the male athletic subculture serve to strengthen important sociological and cultural concepts. Engaging in the ritualistic components of the subculture as a group serves the function of building social cohesion, a common sense of trust, as well as teamwork (Miller, Melnick, Farrell, Sabo & Barnes, 2006). Group involvement in deviant behaviors further helps to strengthen the bonds of brotherhood and friendship among members of the group. A willingness to engage in deviance also displays a sense of loyalty and adherence to the ideals of the group. The readiness to engage in risky activities that may lead to certain repercussions also shows that you are willing to sacrifice individual needs to promote the welfare of the group (Miller et al., 2006). This is another central idea that is highly emphasized in fraternity initiation and also a central philosophy in the male athletic subculture. The athletic subculture is also rather diverse across different sports. Certain contact sports, such as, football, rugby, lacrosse, wrestling, hockey, and boxing are more prone to adherence to the typical ideals of a male-dominated athletic subculture. These sports are inherently violent in nature and aggression is a highly emphasized component of these types of sports. The nature of these full contact sports increases the likelihood of the adherence to and incorporation of the typical values found among the male athletic subculture (Muir & Seitz, 2004).

The tough, macho demeanor that is considered to be an essential component of the image displayed by male athletic subcultures gives rise to much violence among these groups. Excessive aggression and the willingness to fight are considered to be highly favorable attributes among peers in the group. The ability to display courage in the face of an imminent threat is a clear display of toughness and dominance (Muir & Seitz, 2004). Recognition and praise among

your fellow peers serves as differential reinforcement and increases the likelihood of using violence to solve conflicts in the future. The fears of ridicule and peer rejection further increases the likelihood of violence in order to ensure acceptance and recognition amongst the group. Injuries that are sustained either during athletic activity or while engaging in extracurricular group activity are viewed as battle scars and signs of heroism (Muir & Seitz, 2004). Entrance into and acceptance in a male athletic subculture therefore directly fosters the social learning of violence and deviance. Adherence to a strong, masculine, and strictly heterosexual identity does not serve the same level of importance to all men. Yet, these are ideals that are emphasized widely throughout American culture and create an environment in which men may feel more highly obligated to assert their dominance in an effort to conform to this desired image.

Membership in a male athletic subculture does not necessarily guarantee that you will adapt and adhere to the tough, macho image that is displayed within the group. The degree to which you adapt the psychosocial component of this image will likely affect the level of violence and deviance that you engage in. Male athletes who adapt the parameters of the "jock" identity into their persona and reflect these ideals in their personalities are more likely to show a stronger adherence to the values of the male athletic subculture (Miller et al., 2006). Therefore, athletic participation by itself does not necessarily increase your likelihood to become involved in deviant and violent activities. It is the extent to which you adapt and perceive yourself as the indestructible "jock" that is associated with the athletic subculture that truly predicts the likelihood of increased violence and aggression. A stronger adherence to the "jock" identity is also likely to increase the likelihood of involvement in high-risk activities such as binge drinking.

Research on female athletic subculture is much more scarce compared to male athletic subculture. However, the limited studies that are available suggest that male and female athletic subcultures do not operate in identical manners. The female athletic subculture also places a value on violence, aggression, and dominance within the context of the sport and competition. However, the female athletic subculture is much less likely to promote and encourage violence in non-athletic settings (Miller et al., 2006). Evidence also suggests that female athletic subculture identity is much less likely to involve several of the ritualistic behaviors that are commonly associated with entrance into a male athletic subculture. Group participation in deviant activities in an effort to strengthen the bonds of social cohesion and friendship may be much less common amongst female athletes. Previous findings also suggest that a strong adherence to the "jock" identity is a stronger predictor of male violence than female violence. Women that place a high emphasis on the hegemonic, masculine "jock" identity are less likely to engage in violence outside of an athletic context than men who also highly value this characteristic. (Miller et al., 2006)

Athlete steroid users are most likely to become engaged in violence because the pharmacological effects of steroids combined with an adherence to the athletic subculture are the greatest risk factors for violence. Strain theory would suggest that athlete steroid users have the highest level of strain. This is because athlete steroid users face the strain of adhering to the ideals of the athletic subculture as well as the strain of achieving athletic success and the desired muscular physical appearance associated with steroid use. According to Strain theory, people that have high levels of strain and stress are more likely to experience negative emotions, which may cause some to engage in crime in order to cope with or escape these bad feelings. Athlete steroid users may be more prone to an elevated level of strain and therefore more likely to

experience negative emotions associated with this strain. Due to their increase in negative emotions and anger, athlete steroid users would be most likely to engage in crime and deviance. Control theory would suggest that athlete steroid users are likely to have the lowest level of control, partially because the physiological side effects of the steroids and also because of the increased tendency to use violence as a form of assertion in conforming to the athletic subculture. Athlete steroid users would therefore have the lowest constraints to engaging in crime and violence and as a result should be most likely to. Social Learning theory would argue that those who have the highest levels of acceptance and participation in the athletic subculture should be most likely to engage in violence and deviance because they are most likely to be exposed to the social learning of crime. Social Learning theory would predict that athletes who are members of the athletic subculture in general will be the most likely to engage in violence. However, the pharmacological effects of the anabolic steroids are not incorporated into this argument and they are likely to also play a significant role in influencing subsequent violence. Labeling theory would argue that individuals who use anabolic steroids and are also exposed to the athletic subculture would be most likely to adapt the deviant label and therefore most likely to conform to this label in the future. This would again support the hypothesis that athlete steroid users are likely to be prone to the highest levels of violence because of the negative label associated with steroid use as well as the deviant label associated with a strict adherence to the athletic subculture.

Gender

Some past studies support the finding that males are more likely to be aggressive than females (Coie & Dodge, 1997; Maccoby & Jacklin, 1974). Males are especially more likely to use physical aggression in response to a confrontational situation than females (Eagly & Steffen,

1986). Sex differences also arise in the style of aggression that is likely to be used. Females are much more likely to use indirect aggression than males (Feshbach, 1969). Indirect aggression (also known as "social manipulation") generally involves attacking a person without being identified and avoiding a potential counterattack. This type of aggression can include banishing an individual from a social or peer group, spreading hurtful rumors about an individual, or convincing someone else to directly attack the individual (Lagerspetz, Bjorkqvist & Peltonen, 1988). Females are therefore more likely to engage in non-violent forms of aggression compared to males.

One possible explanation for the lower probability of engaging in direct, physical aggression in females is biological. Females naturally tend to have lower physical strength than males and this puts them in a disadvantaged position when it comes to physical confrontation. This in turn may cause females to avoid physical aggression and rely more heavily upon indirect forms of aggressive behavior (Bjorkqvist, 1994). Another potential explanation is based on the idea that females are more likely to have just a few close-knit relationships within their peer groups and males are more likely to have several friends with more distant bonds between them. Indirect aggression can be more effective in causing pain to an individual that you are close with and therefore may be a more successful retaliation technique in a scenario where this close bond of trust may have been betrayed (Maccoby, 1990). Females may also be more likely to use this tactic in order to target this type of relationship amongst two other peers that may have harmed them in some way. Another possible explanation for why females are less likely to engage in physical aggression is dependent upon socialization processes. The degree to which parents discourage physically aggressive behavior in females is much higher than in males. This increased probability of parental disapproval may therefore increase the chance that a female will

use more indirect methods of aggression than a male (Underwood, 2003). Socialization within sex-segregated peer groups can further influence the potential for physical aggression. Male peer groups are more likely to provide physically aggressive models and reinforcement for physically aggressive acts than female peer groups. Female peer groups are more likely to condone physical displays of aggression among females and encourage more covert, indirect forms of aggression (Maccoby, 1990).

Gender differences do not only influence whether or not you are likely to be aggressive and the type (indirect or direct) of aggression that you are likely to engage in. A significant gender gap also exists in amount and type of involvement in crime. All the major types of criminal data (arrest, self-report, and victimization data) indicate that males are more likely to engage in delinquency than females. Males are especially more likely to engage in serious violent and property crime (Agnew, 2009, p. 70). Males are about eighteen times more likely to be arrested for murder and ten times more likely to be arrested for robbery than females (Agnew, 2009, p. 71). The higher rate of offending for males can be partly attributed to the fact that there are more male than female offenders, males commit a greater number of crimes, and there are more high-rate offenders among the male population compared to the female population (Agnew, 2009, p. 70).

Anabolic steroids are likely to affect male and female levels of violence differently. Increased levels of testosterone have been found to increase aggression in some males (Choi et al., 1990). Males naturally produce higher levels of testosterone than females. Anabolic steroids significantly alter the level of testosterone in the body. The increase in testosterone levels may be associated with the "roid rage" that is reported by some users. Some of the pharmacological side effects commonly associated with steroid use, such as increased aggression and hostility,

may be more prolific among males because of their already naturally higher testosterone levels. Therefore, male steroid users may be more likely to engage in violence because the increase in testosterone from anabolic steroids is likely to be much higher than that for females. Prior studies (Coie & Dodge, 1997; Maccoby & Jacklin, 1974; Underwood, 2003) have indicated that males are more likely to become physically aggressive and are also more likely to be socialized to use physical aggression in confrontational situations than females. These two factors are also likely to increase the probability that a male steroid user will be violent compared to a female steroid user. The fact that males are significantly more likely to be arrested for serious violent crimes such as murder also contributes to this effect. Overall, male steroid users are more likely to engage in violence than female steroid users because of their increased natural level of testosterone, greater likelihood of using physical aggression, and increased susceptibility to engaging in serious violent crime.

Hypotheses

Prior studies indicate a general trend of an increased tendency towards violence and deviance among males that strongly adhere to the tough, masculine, and macho image that is promoted among male athletic subcultures. Males are also more likely to be socialized to be physical aggressive and are significantly more likely to engage in serious violent crime. Women have been found to place a higher emphasis on violence and aggression within the context of competition, but do not display this same level of violence in non-athletic environments. Anabolic steroids have been shown to be associated with an increased susceptibility to aggression, maniacal and suicidal thoughts, as well as paranoia and dementia (Pope & Katz, 1994). With an increasing emphasis on physical size and strength in society, many athletes as well as non-athletes may turn to steroids to achieve these desired characteristics. This study

examines the correlation between athletic involvement, gender, steroid use, and subsequent levels of violence. The primary hypotheses of this research study are the following: First, steroid users will be more likely to engage in violence than non-steroid users. Second, athletes that use steroids will be more likely to engage in violence than non-athlete steroid users. Third, male steroid users will be more likely to engage in violence than female steroid users. This is because males have higher natural levels of testosterone, are more likely to use physical aggression, and are more likely to engage in serious violent crime.

Overall, the data obtained from past studies on drugs and crime support the primary hypotheses in this research study. The primary criminological theories also support the predictions made about steroid use, athletic participation, gender, and violence. This research study will serve to further the knowledge concerning the relationship between anabolic steroid use, athletic participation, gender, and violence. The results of this study could help improve future athletic organization and prevention of anabolic steroid use. The findings of this study will have the potential to be further examined and expanded upon in order to develop the most effective techniques for preventing violent crime potentially associated with anabolic steroid use and athletic participation.

Data and Methods

The data set used to test my hypotheses is the "Monitoring the Future Survey for 2009", which was administered to high school students all across the United States. The study was conducted by the University of Michigan and involved the administration of self-report surveys inquiring about a variety of relevant sociological issues. A multistage random sampling design is used to ensure that the sample is representative of students across different geographic locations of the United States. The three major aspects of the sample design include: the

selection of different geographic areas, the selection of particular schools within those regions, and the selection of students from different classes within each of the schools. Out of the schools included in the sample, 350 seniors from within a school is the maximum number of participants that can be involved in the study. For schools with larger senior populations, the sample of respondents chosen to participate is randomly selected from various classes within those schools. For schools that have less than 350 seniors, all of the seniors are included in the sample. Overall, approximately 50, 000 eighth, tenth, and twelfth grade students from about 420 different private and public schools are included in the survey every year.

The "Monitoring the Future Survey" consists of a series of survey questions that have been administered every year to the desired population segment since 1975. The data set has a set of core questions that are used to measure beliefs and practices of adolescents throughout the United States. The total number of seniors selected for administration of the 2009 "Monitoring the Future Survey" was 14, 268. This total sample was divided into six different individual sub samples that consisted of approximately 2, 378 seniors each. Students are randomly assigned to participate in one of six different surveys, but all of them contain the same core questions. There are approximately 1,400 different variables covered by this data set. Some of the core variables examined are drug use patterns on a range of different prescription drugs such as morphine and steroids as well as several illegal drugs such as crack cocaine and ecstasy. Some questions in the survey also look at the respondents' involvement in crime and violence. Other questions also examine different socio-demographic characteristics of the respondents as well as religious beliefs, moral values, self-esteem, and attitudes towards social change. Students that participated in the 2009 survey were able to indicate their race as black, white, or Hispanic. Students that were selected to participate in the study were notified ten days in advance and letters were also

sent to their parents, which allowed them to withdraw their child from participation if they desired. Follow up surveys were also later mailed to those students who participated in the study. The total response rate for the 2009 survey was eighty two percent. Only the sub sample of seniors that responded to Form Three is being used in this study because this was the only version of the survey that contained questions on the relevant variables that are being tested. Specific questions from Codebook Three of the six different forms of the survey that were administered were used to measure the specific variables of steroid use, violence, athletic participation, and gender.

Measures

The independent variable of anabolic steroid use was measured by respondents' answers to question #V2494 "On how many occasions (if any) have you taken steroids on your own—that is, without a doctor telling you to take them during the last twelve months?" Participants could select their level of anabolic steroid use as never, one to five times, or five plus times. The respondents were divided into two groups, those who did not use steroids in the last year and those who used steroids one or more times. This was done because of the fact that there were a very small number of steroid users. Thirty respondents or 1.5 percent of the 2027 participants admitted to using steroids within the last twelve months.

The dependent variable of level of violence was measured by respondents' answers to the following questions: #V2280 "During the LAST 12 MONTHS, how often have you hit an instructor or supervisor?", #V2281 During the LAST 12 MONTHS, how often have you gotten into a serious fight in school or at work?", #V2282 "During the LAST 12 MONTHS, how often have you taken part in a fight where a group of your friends were against another group?", #V2283 "During the LAST 12 MONTHS, how often have you hurt someone badly enough to

need bandages or a doctor?", #V2284 "During the LAST 12 MONTHS, how often have you used a knife or gun or some other thing (like a club) to get something from a person?" These questions were grouped together and recoded as one overall measure of violence. Respondents were divided into two groups: those who had never committed a violent act and those who had been involved in at least one violent act. 24.9 percent or 505 out of the 2027 respondents indicated that they had committed at least one violent act within the last twelve months.

The conditioning variable of athletic participation was evaluated based on respondents' answers to question #V2447 "To what extent have you participated in the following school activities during this school year? Athletic teams." Respondents who indicated that they were athletes were recoded as one and the non-athletes were recoded as zero. There are some potential problems with this measure. The most significant drawback is that there is no way to distinguish between those athletes that participated in contact versus non-contact sports. Certain sports such as football, hockey, lacrosse, and boxing have an inherent violent nature and may be more likely to embrace ideals of the athletic subculture. The frequency of athletic participation as well as participation in multiple athletic teams was also not measured. There is also no way to distinguish between participation in freshmen, junior varsity, and varsity athletic teams. All of these factors could affect the results. The conditioning variable of gender was measured based on respondents' answers to question # V2150 "What is your sex?" Males were recoded as one and females were recoded as two. Percentage tables were used to test my hypotheses. Cross tabulations were formulated for the following: the effect of the level of steroid use on violence, the effect of level of steroid use and athletic participation on the level of violence, and the effect of steroid use and gender on violence. The findings were then related back to the original hypotheses and will be discussed in the Results Section.

Results

Cross Tabulation One: Level of Steroid Use and Level of Violence

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Level of steroid use * Level of violence	2027	85.1%	354	14.9%	2381	100.0%

Level of steroid use * Level of violence Cross Tabulation					
			Level of violence		Total
			None	One or more acts of violence	
Level of steroid use	Never used steroids	N	1511	486	1997
		% within level of steroid use	75.7%	24.3%	100.0%
	Used steroids one or more times	N	11	19	30
		% within level of steroid use	36.7%	63.3%	100.0%
Total		N	1522	505	2027
		% within level of steroid use	75.1%	24.9%	100.0%

Steroid Use and Violence

Some trends can be observed from the cross tabulation between the level of anabolic steroid use and the level of violence for the sample of 2027 participants that responded to the questions relating to these variables. 63.3 percent of steroid users admitted to engaging in at least one violent act versus 24.3 percent of non-users. After performing Pearson's chi-square analysis, the significance value is 0.000, which is less than .05. This means that the probability of the differences between the variables being due to chance is less than five percent, which indicates that the level of violence is dependent on the level of steroid use. Overall, the results of this cross tabulation indicate that anabolic steroid users are more likely to be violent than non-

steroid users. Also, unlike many previous studies, this study has the advantage of being based on a national sample of adolescents.

Cross Tabulation Two: Athletic Involvement, Level of Steroid Use, and Level of Violence

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Level of steroid use * Level of violence * recode of V2447: Student Athlete or Not	1909	80.2%	472	19.8%	2381	100.0%

Level of steroid use * Level of violence * recode of V2447: Student Athlete or Not Cross Tabulation

recode of V2447: Student Athlete or Not				Level of violence		Total
				None	One or more acts of violence	
Non-Athlete	level of steroid use	Never used steroids	N	678	195	873
			% within level of steroid use	77.7%	22.3%	100.0%
		Used steroids one or more times	N	3	5	8
			% within level of steroid use	37.5%	62.5%	100.0%
	Total		N	681	200	881
			% within level of steroid use	77.3%	22.7%	100.0%
Athlete	level of steroid use	Never used steroids	N	753	154	1007
			% within level of steroid use	74.8%	25.2%	100.0%
		Used steroids one or more times	N	7	14	21
			% within level of steroid use	33.3%	66.7%	100.0%
	Total		N	760	268	1028
			% within level of steroid use	73.9%	26.1%	100.0%

Steroid Use and Violence among Athletes and Non-Athletes

The initial hypothesis was that athlete steroid users would be more likely to engage in violence than non-athlete steroid users because athletes would be more likely to place a high emphasis on the tough, machismo, and hyper-masculine ideals promoted by the athletic subculture. The cross tabulation for athletic involvement, the level of anabolic steroid use, and the level of violence for a sample of 1909 participants indicated these patterns. 66.7 percent of athlete steroid users admitted to engaging in violence, while 62.5 percent of non-athlete steroid users claimed that they had engaged in violence. After performing Pearson's chi-square analysis, the significance values are 0.005 for non-athlete steroid users and 0.000 for athlete steroid users. These values are statistically significant and indicate that the results of the cross tabulation are not due to chance. There is very little variation between the percentage of athlete steroid users and non-athlete steroid users that admitted to engaging in violence. There were only eight non-athletes who admitted to using steroids and twenty-one athletes who used steroids. This sample is very small and therefore could have affected the results. Overall, the findings do not support the hypothesis. A significant difference in the levels of violence between athlete steroid users and non-athlete steroid users was not found. However, anabolic steroid use was associated with higher levels of violence in both athletes and non-athletes. 62.5 percent of non-athlete steroid users engaged in violence compared to 22.3 percent of non-athletes who had never used steroids. 66.7 percent of athlete steroid users indicated that they had engaged in violence compared to 25.2 percent of athletes who had never used steroids.

Cross Tabulation Three: Gender, Level of Steroid Use, and Level of Violence

Case Processing Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Level of steroid use * Level of violence * Gender	1958	82.2%	423	17.8%	2381	100.0%

Level of steroid use * Level of violence * Gender Cross Tabulation						
Gender				Level of violence		Total
				None	One or more acts of violence	
Female	Level of steroid use	Never used steroids	N	809	213	1022
			% within level of steroid use	79.2%	20.8%	100.0%
		Used steroids one or more times	N	5	5	10
			% within level of steroid use	50.0%	50.0%	100.0%
	Total		N	814	218	1032
			% within level of steroid use	78.9%	21.1%	100.0%
Male	Level of steroid use	Never used steroids	N	659	251	910
			% within level of steroid use	72.4%	27.6%	100.0%
		Used steroids one or more times	N	4	12	16
			% within level of steroid use	25.0%	75.0%	100.0%
	Total		N	663	263	926
			% within level of steroid use	71.6%	28.4%	100.0%

Steroid Use and Violence among Males and Females

The initial hypothesis here was that males who use steroids would be more likely to engage in violence than females who use steroids because females would be less likely to be socialized to be physically aggressive and females also have much lower levels of testosterone

naturally. The cross tabulation for gender, the level of anabolic steroid use, and the level of violence for a sample of 1958 participants indicated these trends. Fifty percent of females who had used steroids admitted to engaging in violence, versus seventy five percent of the male steroid users. After performing Pearson's chi-square analysis, the significance values are 0.039 for female steroid users and 0.000 for male steroid users. These values are statistically significant and indicate that the level of violence is dependent on whether anabolic steroid users are male or female. The sample of male steroid users (sixteen respondents) and female steroid users (ten respondents) was quite small, however, which could affect the findings. It should also be noted that steroid users were more likely to be violent than nonusers among both males and females. Taken as a whole, the three cross tabulations indicate these general trends. Anabolic steroid users were much more likely to be violent than non-steroid users. Athletes that used steroids were not found to be more likely to engage in violence than non-athletes that used steroids. Anabolic steroid use was associated with higher levels of violence in both athletes and non-athletes. Females who used steroids were more likely to be violent than females who did not use steroids. Males who used steroids were much more likely to engage in violence, especially multiple acts of violence than males who had not used steroids. Males who used steroids were more likely to engage in violence than females who used steroids.

Discussion

Past studies that have examined the relation between anabolic steroid use and violence have focused mainly on the pharmacological, physiological, and psychological side effects associated with the use of anabolic steroids and how these affect levels of crime and violence (Choi et al., 1990; Isacsson et al., 1998; Klotz et al., 2006; Pope & Katz, 1994; Pope et al., 2000). Anabolic steroid use has caused users to experience increased irritability, aggression,

hostility, maniacal behavior, severe depression, and paranoia (Pope & Katz, 1994). Steroid users have also been shown to have an increased probability of experiencing uncontrollable fits of rage, also known as "roid rage". The majority of studies in the past have also focused on very small non-random samples of steroid users from one geographic location (Isacsson et al., 1998; Klotz et al., 2006; Pope & Katz, 1994; Pope et al., 2000). Not all studies have found anabolic steroid use to be associated with increased levels of violence (Isacsson et al., 1998; Klotz et al., 2006). The previous literature on anabolic steroid use and violence has produced generally mixed findings. Very few studies have examined the impact of anabolic steroid use across different types of people and across different geographic populations.

This study has further expanded on the previous research involving steroids and violence. In particular, this is the first study that has examined the specific effect of athletic participation and gender on anabolic steroid use and violence. The findings of this study are also based on a nationally representative sample of adolescence. A significant amount of research has been done in the past that has examined the athletic subculture associated with participation in many sports teams. The key ideals and values that are promoted among the male athletic subculture are homophobia, misogyny, and the machismo attitude (Muir & Seitz, 2004). The internalization and incorporation of these values into your beliefs and attitude is a key component to gaining recognition and acceptance by other members of the athletic subculture. Studies that have examined the athletic subculture have also found it to be associated with higher levels of violence, aggression, and an increased likelihood to engage in risky and deviant activities (Muir & Seitz, 2004; Miller et al., 2006). The willingness to engage in deviant activities such as fighting serves the purpose of reinforcing your loyalty to the central ideologies promoted by the group. The initial hypotheses of this study were that athletes who used steroids would be more

likely to engage in violence than non-athletes who used steroids. Steroid users in general will be more likely to engage in violence than non-users because of the pharmacological and physiological side effects of the drugs that lead to increased aggression, hostility, and maniacal behavior. Male steroid users would be more likely to be violent than female steroid users because male steroid users are more likely to be socialized to use physical aggression, are more susceptible to engaging in serious violent crime, and have naturally higher levels of testosterone. This combined with the pharmacological and physiological side effects of steroids would likely increase the probability that males would be more likely to engage in violence than females.

The results of this study indicated that 63.3 percent of steroid users reported engaging in at least one violent act compared to 24.3 percent of non-users. Anabolic steroid users were found to have a higher likelihood to engage in violence than non-users. This finding supports the original hypothesis. This effect is most likely a result of the pharmacological, physiological, and psychological side effects associated with steroid use that lead to increased levels of irritability, aggression, hostility, and maniacal behavior by some users. The "roid rage" commonly experienced by steroid users is also likely to have contributed to this finding. It could also be attributed to the fact that males may be more likely to use anabolic steroids than females and males are prone to higher levels of violence than females. The higher percentage of male steroid users could also contribute to the increased instances of violence displayed by steroid users compared to non-users. This result supports the findings of several previous studies (Middleman et al., 1995; Pederson et al., 2001; Pope & Katz, 1994, Pope et al., 2000) that have indicated an association between steroid use and an increased likelihood to be violent.

The primary hypothesis that athlete steroid users would be more likely to engage in violence than non-athlete steroid users was not supported by the results of this study. 66.7

percent of athlete steroid users admitted to engaging in violence compared to 62.5 percent of non-athlete steroid users that reported being violent. There is very little variation between the percentage of athlete and non-athlete steroid users that reported being involved in violence. It was thought that athletes are more likely to be exposed to athletic subcultures and therefore would be more likely to internalize the tough, machismo, and hyper-masculine values promoted by the athletic subculture. This adherence to a more aggressive and deviant demeanor combined with the pharmacological, physiological, and psychological side effects associated with the use of steroids would significantly increase the likelihood of engaging in violence. However, the findings of this study do not support this argument. The results may not support the initial hypothesis because of some methodological problems. The sample of athlete and non-athlete steroid users was quite small. The low frequency of steroid use in the sample could potentially imply that steroid use is not that common among high school students. However, anabolic steroid use is a practice that is associated with serious potential repercussions. Fear of potentially having their steroid use be exposed could have influenced users to under report or even lie about their actual levels of steroid use. This is likely to have played a part in the low response rate and could explain the small number of respondents that admitted to steroid use. There were only twenty-one athlete steroid users and eight non-athlete steroid users. This small sample size could have biased the results. Also, the students that were administered the "Monitoring the Future Survey for 2009" during school time voluntarily participated in the survey. Those students that chose not to participate and those students that were not present in school may have been those that were most likely to have used steroids. The exclusion of these students could have impacted the results and potential generalizability to the larger population.

Another potential methodological problem may have been with the measure of athletic participation. The most significant limitation of this measure was that there was no way to distinguish between athletes that had participated in contact versus non-contact sports. Also, there was no measure for the frequency of athletic participation or for participation in multiple athletic teams. Certain contact sports, such as football, lacrosse, and boxing are inherently violent and may be more likely to have athletic subcultures surrounding them that embrace tough, hyper-masculine, and machismo ideals. Participation in an athletic team in general does not necessarily guarantee exposure to or involvement in an athletic subculture. A more accurate measure of athletic participation that distinguished between contact and non-contact sports as well as a measurement for the degree of internalization and incorporation of ideals promoted by the athletic subculture would have provided more reliable results. A study that included a larger sample of steroid users and a more accurate measure of athletic participation would be better suited to test the initial hypothesis.

However, the initial argument may also be inaccurate. It is possible that the violence that has been found to be associated with steroid use by some studies in the past may be the result of just the pharmacological, physiological, and psychological side effects associated with anabolic steroids. Involvement in an athletic subculture may not significantly impact or may not be associated at all with a steroid user's likelihood to engage in violence. The fact that the results of this study do not support the initial argument does not completely invalidate it. A study that corrects for the methodological deficiencies of this study may find support for the original hypothesis that athlete steroid users that adhere strongly to the ideals of the male athletic subculture would be more likely to be violent than non-athlete steroid users.

The results of this study supported the third hypothesis that was made. Male steroid users were found more likely to be violent than female steroid users. Seventy five percent of male steroid users admitted to engaging in at least one violent act compared to fifty percent of female steroid users that admitted engaging in violence. The initial reasoning behind this argument was that males would be more likely to use physical aggression and more likely to engage in serious violent crime than females. Males also have naturally higher levels of testosterone, which affects levels of aggression. Males are also believed to be inherently more violent than females. These characteristics combined with side effects of steroid usage, such as increased irritability, aggression, and hostility would make males more likely to be violent than females. Also, the pharmacological side effects associated with steroid use have different physical and physiological effects on males and females. Males may be more likely to experience increases in anger, aggression, hostility, and irritability from the side effects of steroids than females. Overall, the findings of this study support the arguments that steroid users are more likely to engage in violence than non-users and that male steroid users are more likely to be violent than female steroid users. The results do not provide any support for the primary hypothesis that athletes that used steroids would be more likely to engage in violence than non-athletes that used steroids. However, this finding could potentially be the result of methodological deficiencies that were discussed earlier.

This study has some limitations. The measure of athletic participation is not ideal because it fails to distinguish between contact and non-contact sports and also does not measure the frequency of athletic participation. The sample of steroid users is quite small (only thirty respondents) and this increases the possibility of the associations that were found to be due to chance. A larger population of steroid users would decrease the possibility of an association due

to chance and increase the generalizability of the findings. Perhaps the most significant limitation of this study was the failure to control for relevant third variables. There are several relevant third variables that have been found to be associated with delinquent behavior in the past. In particular, the following third variables could have had an impact on the results: association with delinquent peers, parental socialization, attachment to family members, stake in conformity, low self-control, irritability, simultaneous use of other drugs, child abuse, prior involvement in violence, and religious affiliation. The failure to control for these relevant third variables allows for the possibility that the associations that were found in this study to be due to a potential intervening third variable. Causality is also a limitation of this study. The data that were analyzed in this study were cross-sectional. It is impossible to rule out the idea that an increased likelihood to be violent may increase the likelihood of taking steroids. A longitudinal research study that observed the same population of steroid users over an extended period of time would allow for a stronger causal understanding of the relationships between variables that were found.

Future studies that examine this topic should incorporate a better measure of athletic participation. In particular, the measure should be able to distinguish between the type of sport played and also the frequency of athletic participation. Also, researchers may want to focus on a measure for the level of adaptation and internalization of the values and ideals promoted by the athletic subculture. This could help strengthen the argument that athletic participation leads to increased violence among steroid users if an association was found between the two. Future studies should also attempt to acquire a larger random sample of steroid users. This would significantly increase the generalizability of the findings and decrease the possibility of any

association that was found being due to chance. A longitudinal research design would also help to strengthen causal order between any possible associations that were found.

This study deals with a very important issue in contemporary society. An increasing number of athletes are experimenting with anabolic steroids in an attempt to gain a competitive edge in their respective sport. An increasing emphasis on looks and physical appearances has also led some men into using steroids. These drugs are capable of significantly altering strength, speed, and physical appearance. Anabolic steroids are also becoming more easily available via the Internet and other sources, which is further contributing to the problem. The findings of this study support the argument that anabolic steroid use leads to an increased likelihood to be violent, especially amongst men. This should deter individuals from using these drugs for non-medicinal purposes in the future. These findings should also encourage society to crack down on the illegal distribution and sale of anabolic steroids. Professional sports organizations have implemented active steroid testing among athletes. However, on the collegiate and high school levels steroid testing is not nearly as actively employed. The findings of this study should encourage steroid testing to be more actively implemented, especially among high school athletes. The findings of this study provide further support for an association between anabolic steroids and violence. This study has helped to expand on the general knowledge of the potential consequences of steroid use and may also help with future deterrence of anabolic steroid use.

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