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Steroids (Anabolic-Androgenic)

Anabolic-androgenic steroids (AAS) are synthetically produced variants of the naturally occurring male sex hormone testosterone. "Anabolic" refers to muscle-building, and "androgenic" refers to increased male sexual characteristics. "Steroids" refers to the class of drugs. These drugs can be legally prescribed to treat conditions resulting from steroid hormone deficiency, such as delayed puberty, as well as diseases that result in loss of lean muscle mass, such as cancer and AIDS.

How Are AAS Abused?

Some people, both athletes and non-athletes, abuse AAS in an attempt to enhance performance and/or improve physical appearance. AAS are taken orally or injected, typically in cycles rather than continuously. "Cycling" refers to a pattern of use in which steroids are taken for periods of weeks or months, after which use is stopped for a period of time and then restarted. In addition, users often combine several different types of steroids in an attempt to maximize their effectiveness, a practice referred to as "stacking."

How Do AAS Affect the Brain?

The immediate effects of AAS in the brain are mediated by their binding to androgen (male sex hormone) and estrogen (female sex hormone) receptors on the surface of a cell. This AAS–receptor complex can then shuttle into the cell nucleus to influence patterns of gene expression. Because of this, the acute effects of AAS in the brain are substantially different from those of other drugs of abuse. The most important difference is that AAS are not euphorigenic, meaning they do not trigger rapid increases in the neurotransmitter dopamine, which is responsible for the "high" that often drives substance abuse behaviors. However, long-term use of AAS can eventually have an impact on some of the same brain pathways and chemicals—such as dopamine, serotonin, and opioid systems—that are affected by other drugs of abuse. Considering the combined effect of their complex direct and indirect actions, it is not surprising that AAS can affect mood and behavior in significant ways.

AAS and Mental Health

Preclinical, clinical, and anecdotal reports suggest that steroids may contribute to psychiatric dysfunction. Research shows that abuse of anabolic steroids may lead to aggression and other adverse effects.[1] For example, although many users report feeling good about themselves while on anabolic steroids, extreme mood swings can also occur, including manic-like symptoms that could lead to violence.[2]

Researchers have also observed that users may suffer from paranoid jealousy, extreme irritability, delusions, and impaired judgment stemming from feelings of invincibility.

Addictive Potential

Animal studies have shown that AAS are reinforcing—that is, animals will self-administer AAS when given the opportunity, just as they do with other addictive drugs.[3,4] This property is more difficult to demonstrate in humans, but the potential for AAS abusers to become addicted is consistent with their continued abuse despite physical problems and negative effects on social relations.[5] Also, steroid abusers typically spend large amounts of time and money obtaining the drug: this is another indication of addiction. Individuals who abuse steroids can experience withdrawal symptoms when they stop taking AAS—these include mood swings, fatigue, restlessness, loss of appetite, insomnia, reduced sex drive, and steroid cravings, all of which may contribute to continued abuse. One of the most dangerous withdrawal symptoms is depression—when persistent, it can sometimes lead to suicide attempts.

Research also indicates that some users might turn to other drugs to alleviate some of the negative effects of AAS. For example, a study of 227 men admitted in 1999 to a private treatment center for dependence on heroin or other opioids found that 9.3 percent had abused AAS before trying any other illicit drug. Of these, 86 percent first used opioids to counteract insomnia and irritability resulting from the steroids.[6]

What Other Adverse Effects Do AAS Have on Health?

Steroid abuse can lead to serious, even irreversible health problems. Some of the most dangerous among these include liver damage; jaundice (yellowish pigmentation of skin, tissues, and body fluids); fluid retention; high blood pressure; increases in LDL ("bad" cholesterol); and decreases in HDL ("good" cholesterol). Other reported effects include renal failure, severe acne, and trembling. In addition, there are some gender- and age-specific adverse effects:

- For *men*—shrinking of the testicles, reduced sperm count, infertility, baldness, development of breasts, increased risk for prostate cancer
- For *women*—growth of facial hair, male-pattern baldness, changes in or cessation of the menstrual cycle, enlargement of the clitoris, deepened voice
- For *adolescents*—stunted growth due to premature skeletal maturation and accelerated puberty changes; risk of not reaching expected height if AAS is taken before the typical adolescent growth spurt

In addition, people who inject AAS run the added risk of contracting or transmitting HIV/AIDS or hepatitis, which causes serious damage to the liver.

What Treatment Options Exist?

There has been very little research on treatment for AAS abuse. Current knowledge derives largely from the experiences of a small number of physicians who have worked with patients undergoing steroid withdrawal. They have learned that, in general, supportive therapy combined with education about possible withdrawal symptoms is sufficient in some cases. Sometimes, medications can be used to restore the balance of the hormonal system after its disruption by steroid abuse. If symptoms are severe or prolonged, symptomatic medications or hospitalization may be needed.

How Widespread Is AAS Abuse?

Monitoring the Future Survey[†]

Monitoring the Future is an annual survey used to assess drug use among the Nation's 8th-, 10th-, and 12th-grade students. While steroid use remained stable among all grades from 2007 to 2008, there has been a significant reduction since 2001 for nearly all prevalence periods (i.e., lifetime,[††] past-year, and past-month use) among all grades surveyed. The exception was past-month use among 12th-graders, which has remained stable. Males consistently report higher rates of use than females: for example, in 2008, 2.5 percent of 12th-grade males, versus 0.6 percent of 12th-grade females, reported past-year use.

Anabolic Steroid Use by Students 2008 Monitoring the Future Survey

	8th Grade	10th Grade	12th Grade
Lifetime[††]	1.4%	1.4%	2.2%
Past Year	0.9%	0.9%	1.5%
Past Month	0.5%	0.5%	1.0%

Other Information Sources

For a list of street terms used to refer to steroids and other drugs, visit **www.whitehousedrugpolicy.gov/streetterms/default.asp.**

For additional information on the effects of anabolic-androgenic steroids and information on healthy alternatives, please visit NIDA's Web site on steroids, **www.steroidabuse.org.**

† These data are from the 2008 Monitoring the Future survey, funded by the National Institute on Drug Abuse, National Institutes of Health, Department of Health and Human Services, and conducted by the University of Michigan's Institute for Social Research. The survey has tracked 12th-graders' illicit drug use and related attitudes since 1975; in 1991, 8th- and 10th-graders were added to the study. The latest data are online at **www.drugabuse.gov.**

†† "Lifetime" refers to use at least once during a respondent's lifetime. "Past year" refers to use at least once during the year preceding an individual's response to the survey. "Past month" refers to use at least once during the 30 days preceding an individual's response to the survey.

References

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