

Anabolic Steroid Use: A Looming Public Health Problem?

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November 14, 2017

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Anabolic-Androgenic Steroids (AAS):

Testosterone: The natural male hormone

**Synthetic hormones similar to
testosterone:**

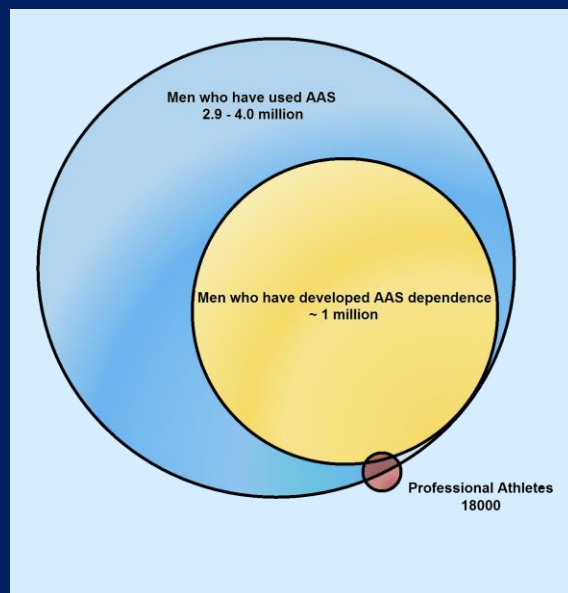
- Nandrolone (Deca-Durabolin)
- Methenolone (Anadrol)
- Methandienone (Dianabol)
- Stanozolol (Winstrol)

History of AAS:

- **1935:** Testosterone first isolated by David et al.
- **1940's:** Many synthetic AAS developed
- **1950-1980:** AAS spreads through elite athletics
- **1980's:** AAS use spreads to non-athletes
- **1990-2010:** AAS use becomes widespread among young men in Western countries

Thus, most illicit AAS users are young, rank-and-file gym clients who are NOT competitive athletes.

AAS Use Among American Men



Myths About AAS Use

Most AAS users are competitive athletes.

AAS use is common in adolescents.

Girls and women often use AAS.

Why do People Use AAS?:

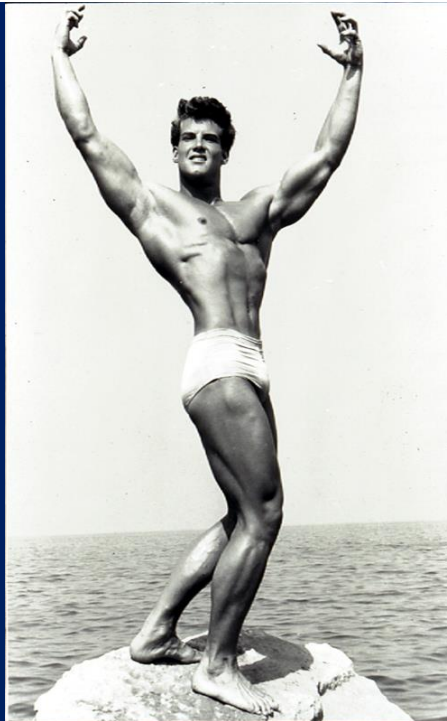
I. Highly Effective Drugs

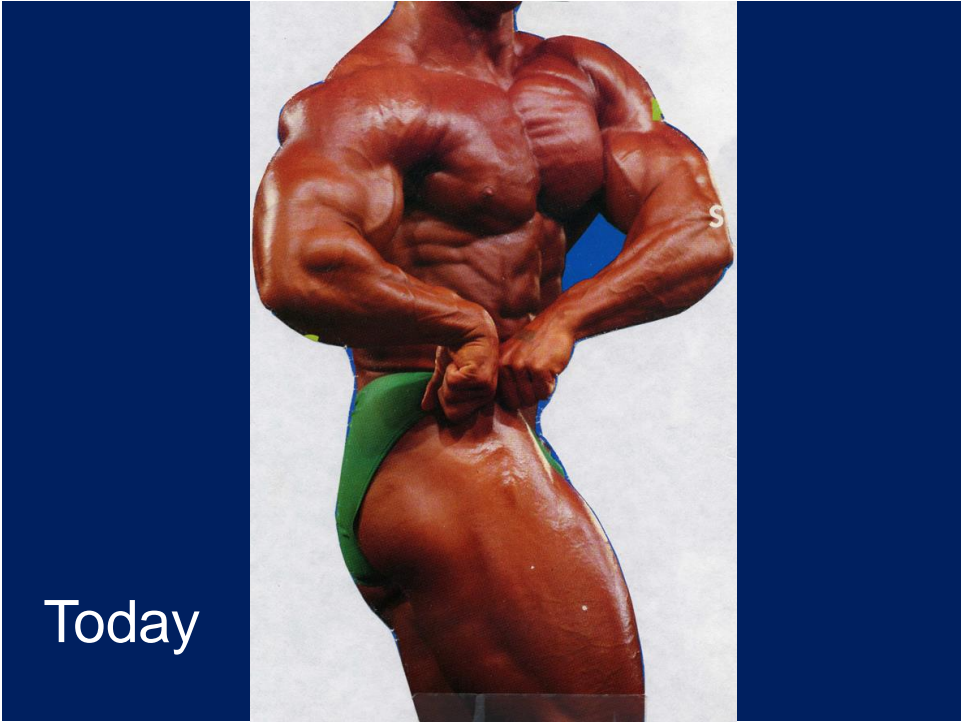
II. Supportive Social Climate

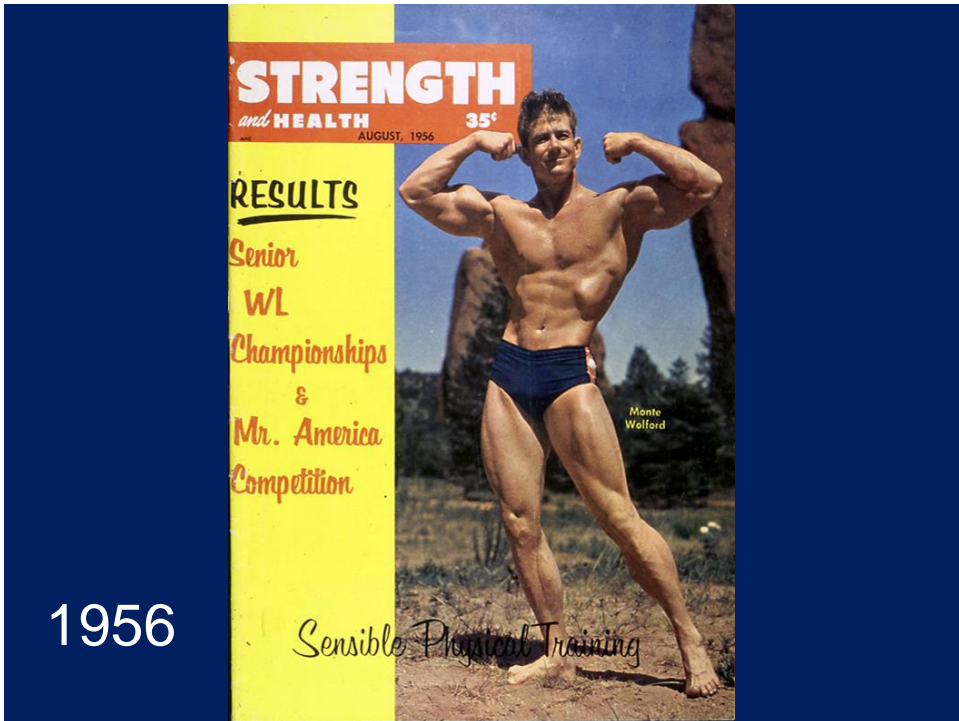
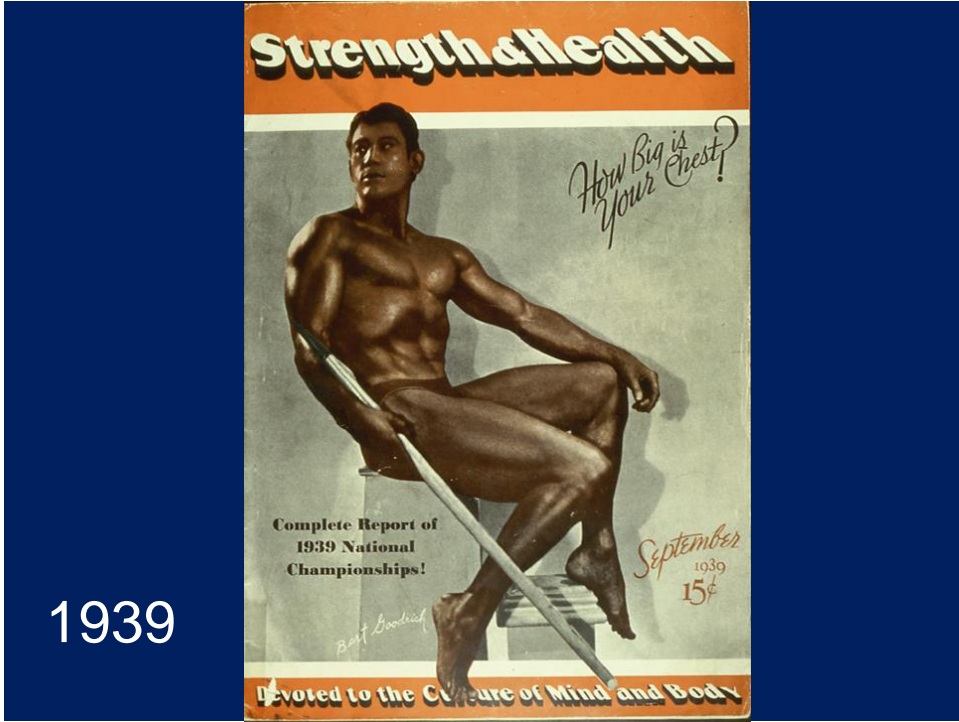
**III. Individuals with Body-Image
Concerns**

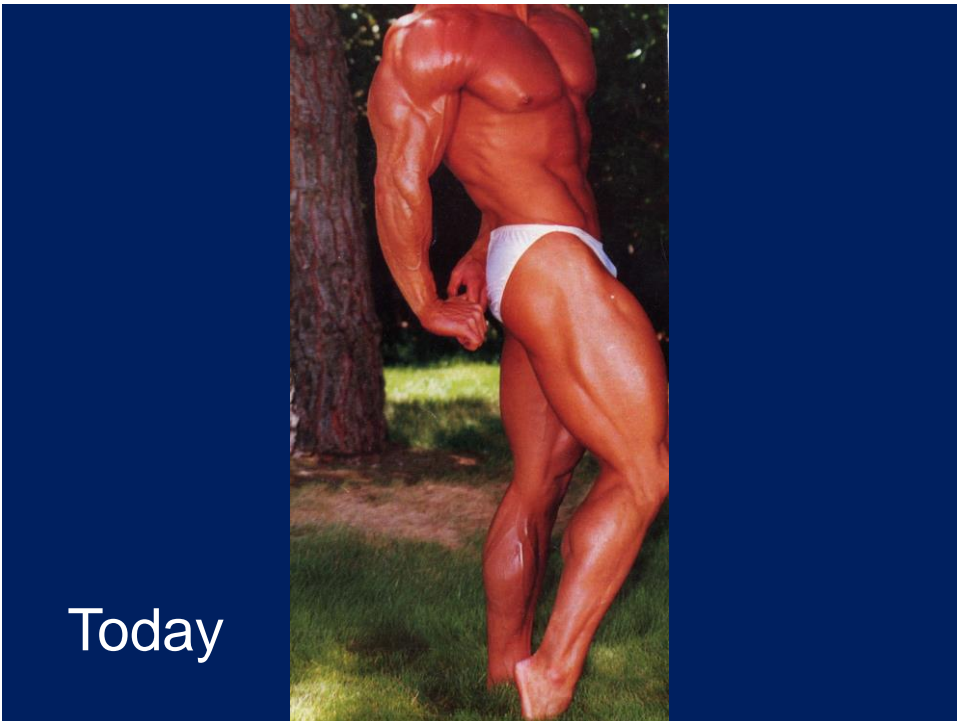
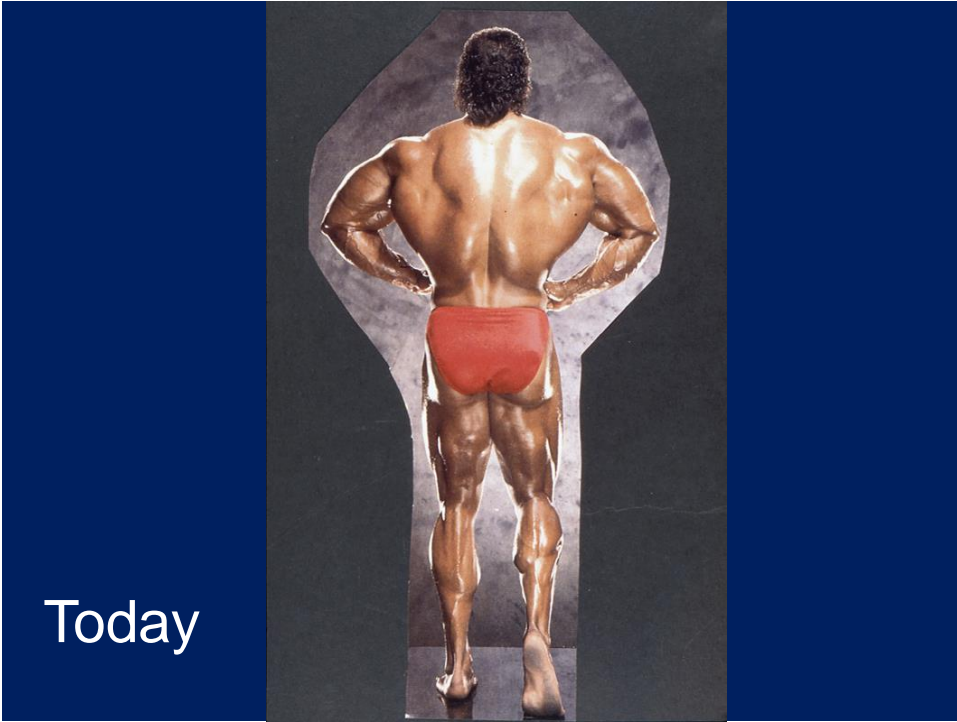
I. Highly Effective Drugs

1947









II. Supportive Social Climate



GI Joe : Small Version



1982



1991



1997

Star Wars : Luke Skywalker

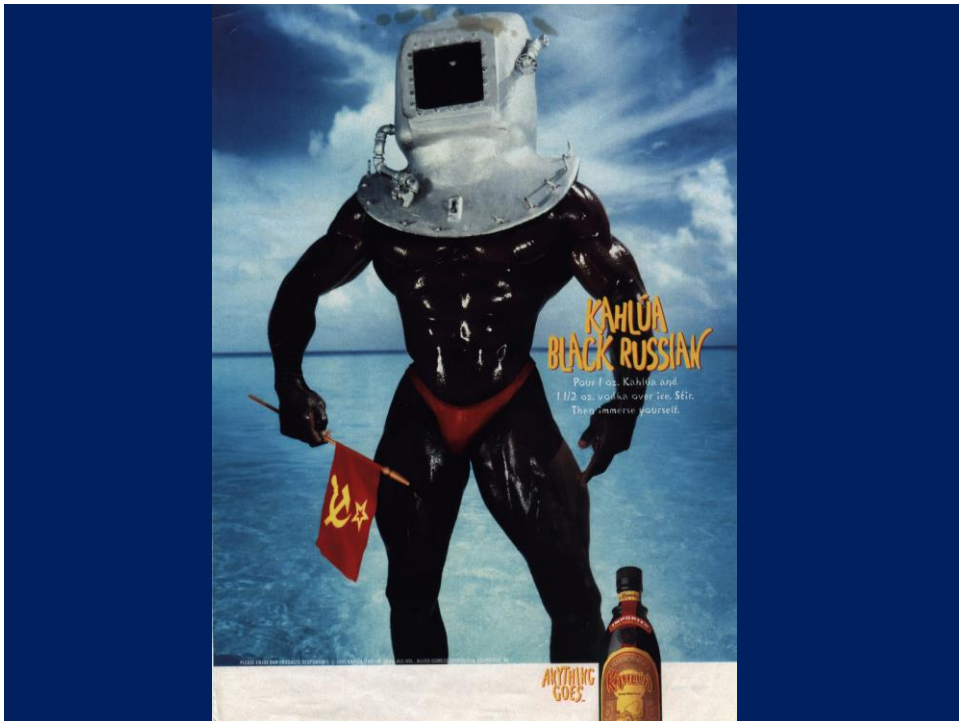


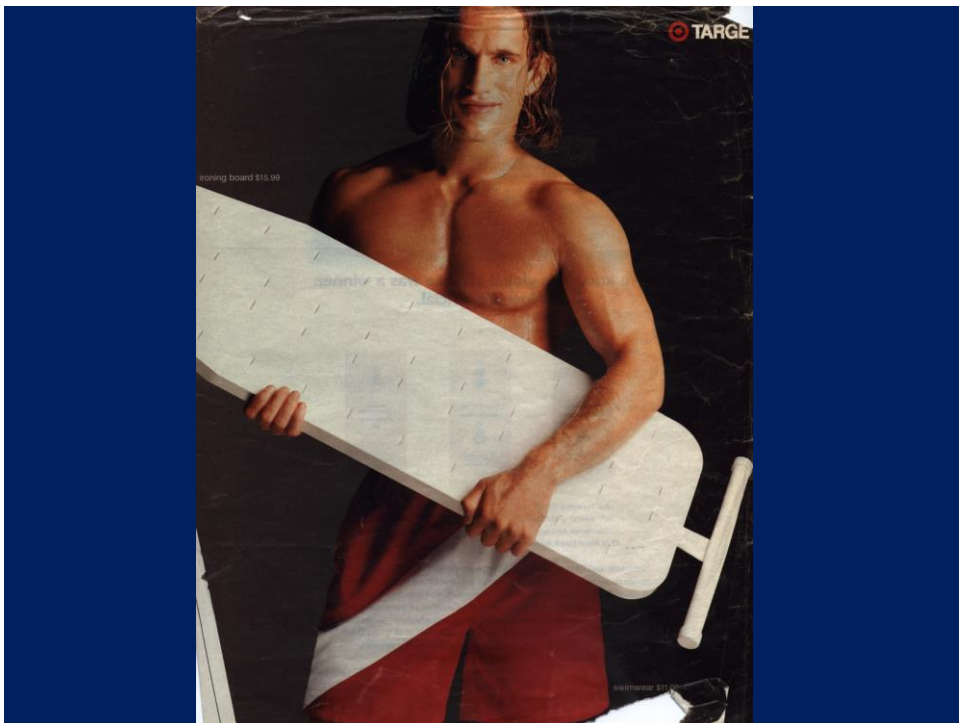
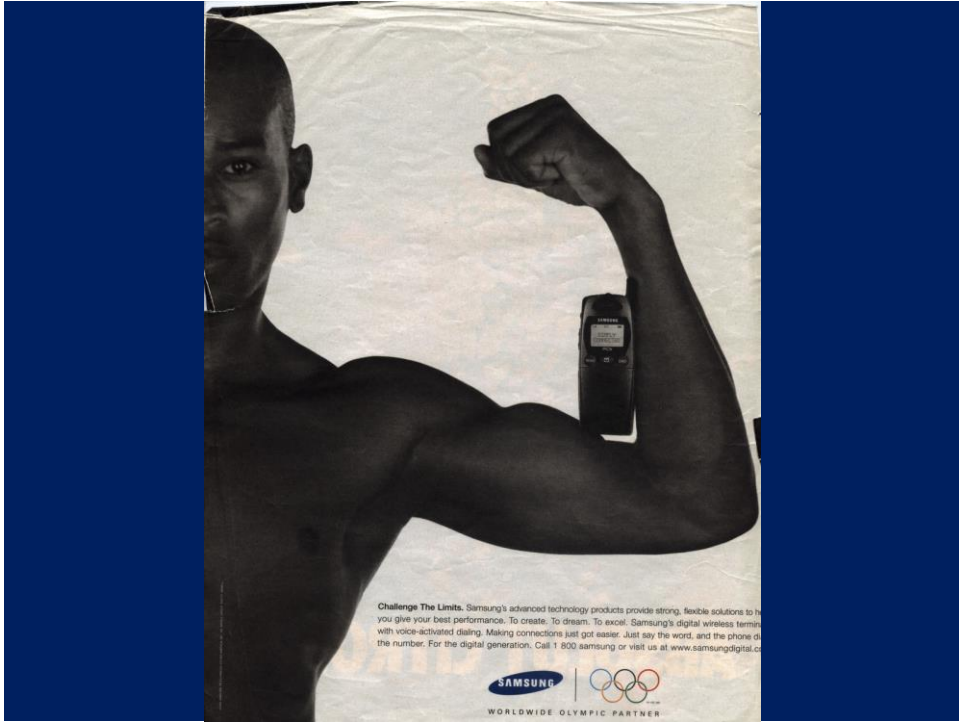
1977

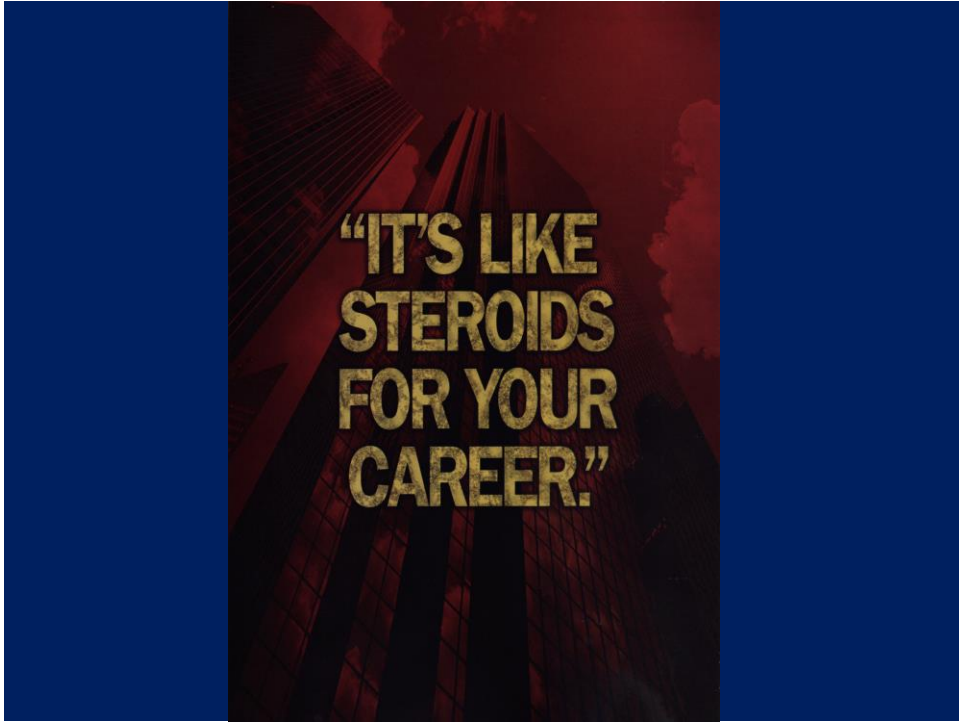



1997

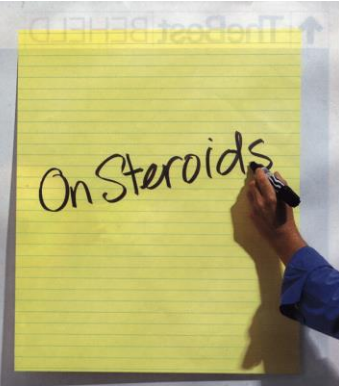
Star Wars : Han Solo









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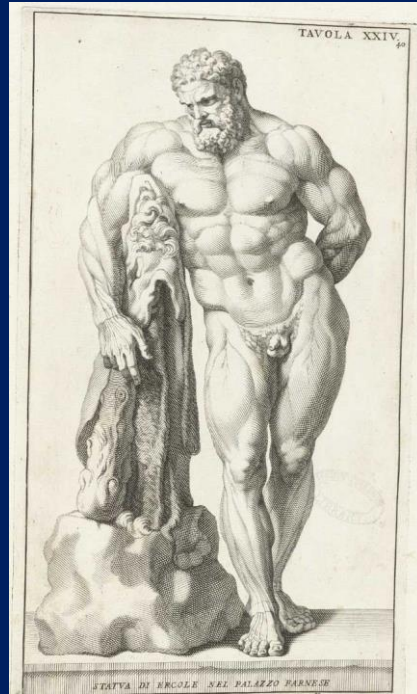
You're in a meeting, capturing ideas on your easel pad. But then everything grinds to a halt as you search for tacks or tape. Unless you're using a Post-it® Easel Pad. Its pages stick to the wall by themselves, with a strong adhesive. They're even repositionable. So stick with the easel pads that stick. Post-it® Easel Pads.

For more information, contact us at 1-800-328-6276, or www.3M.com/Post-it



Western Mythological Tradition:

Bernadino Genga's drawing of the Farnese statue of Herakles (1691)



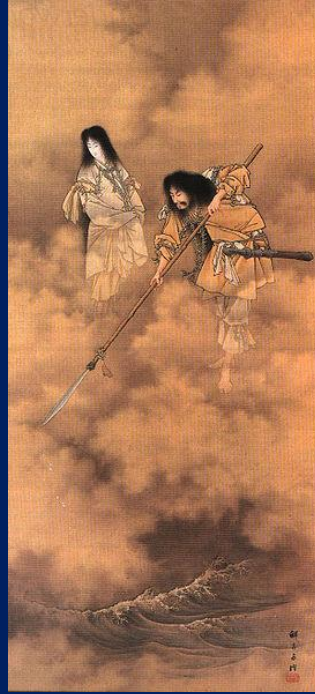
Scandinavian Mythological Tradition:

Johann Heinrich Füssli's *Der Kampf des Thor mit der Schlange des Midgard* (1788)



**Japanese
Mythological
Tradition:**

Eitaku Kobayashi's
Izanagi and Izanami
(1885)

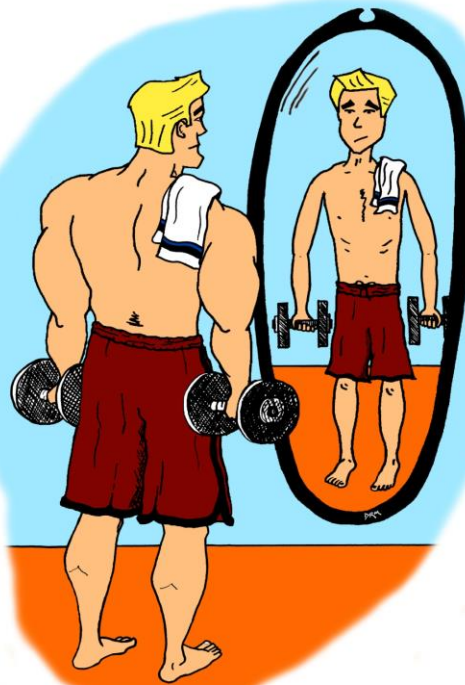


**Japanese
Mythological
Tradition:**

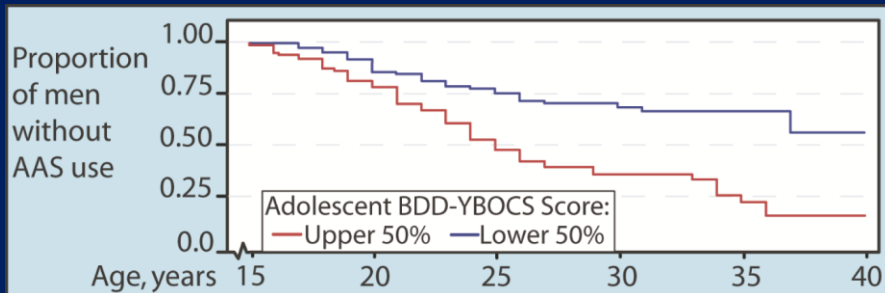
Unknown sculptor:
Seated Male Deity
(c. 800)



III. Individuals With Body-Image Concerns



Time to onset of AAS use for men with high vs. low adolescent body-image concerns



Pope et al., *Biological Psychiatry*, 2011

Highly Effective Drugs

+

Supportive Social Climate

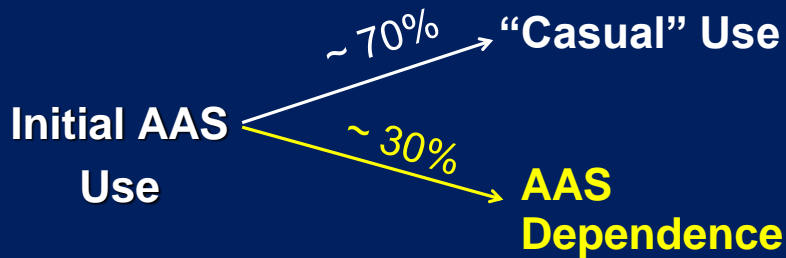
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Individuals With
Body-Image Concerns



Steroid Use

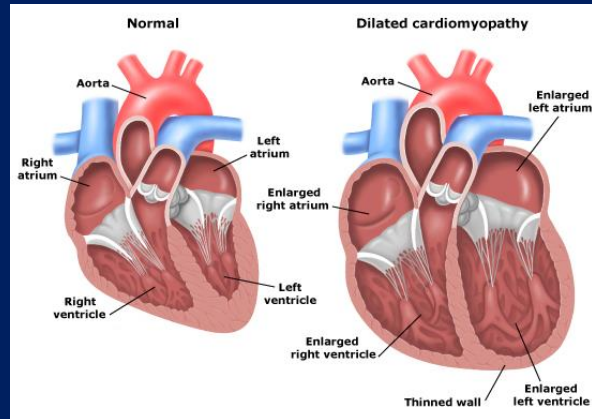
Who is at risk for possible adverse AAS effects?



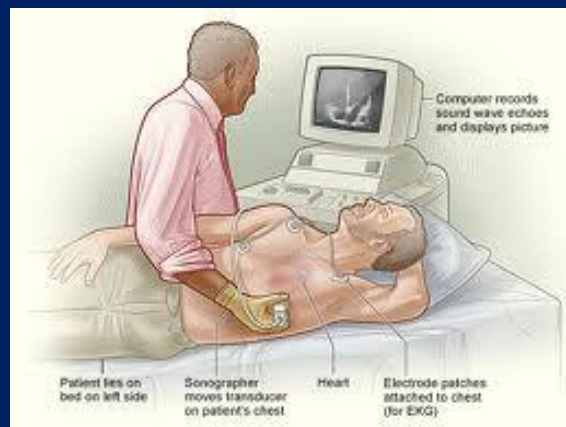
What Should We Be Worrying About?

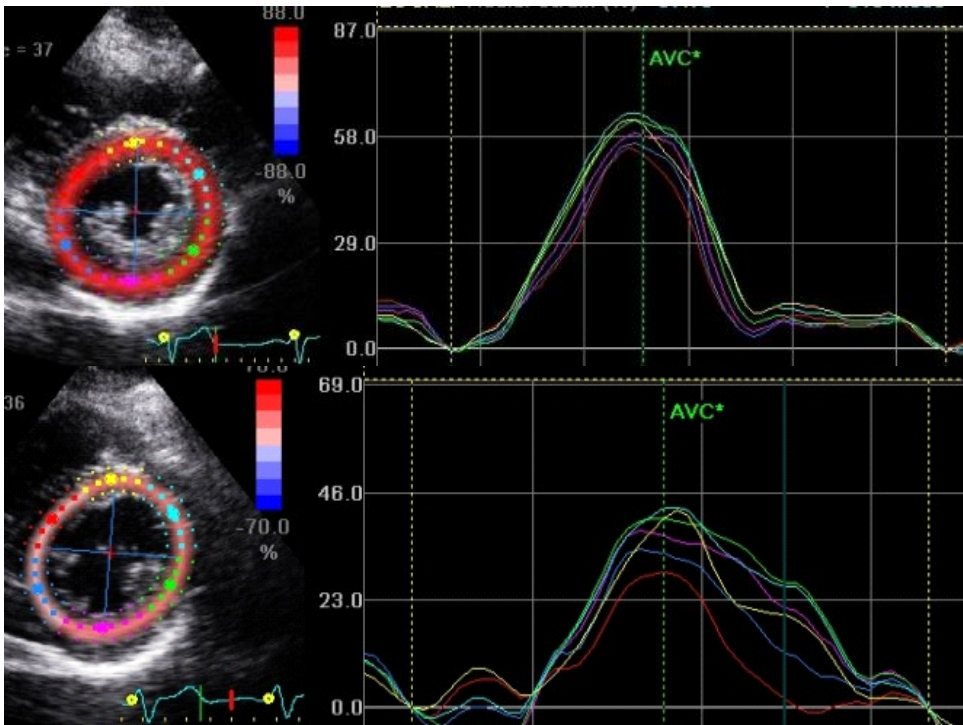
- Cardiovascular effects
- Persistent hypogonadism
- Psychiatric disorders
- Neurotoxicity

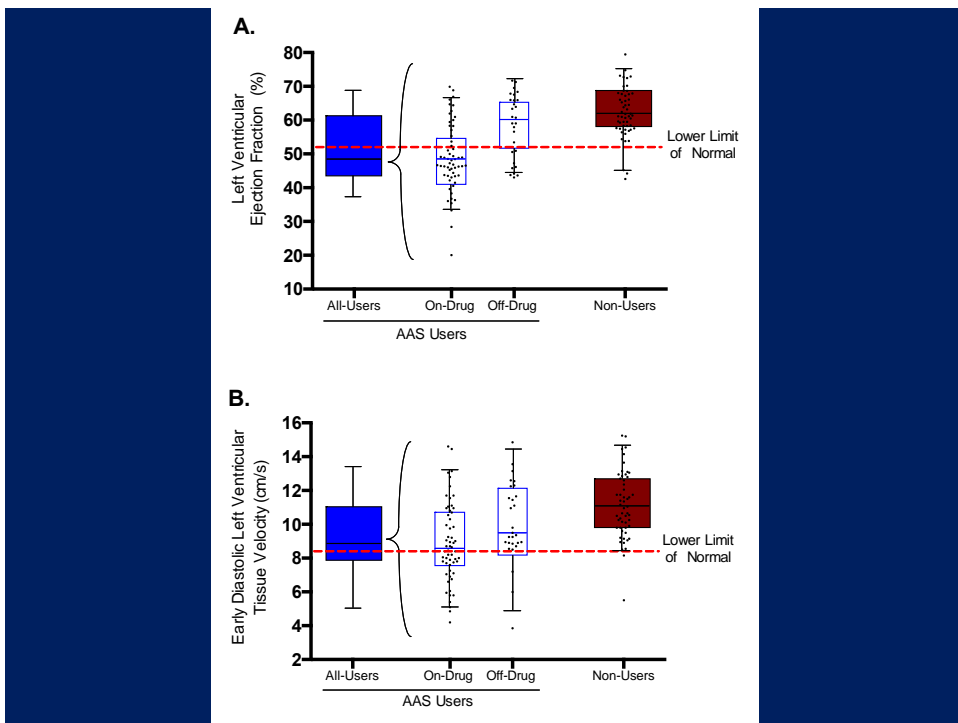
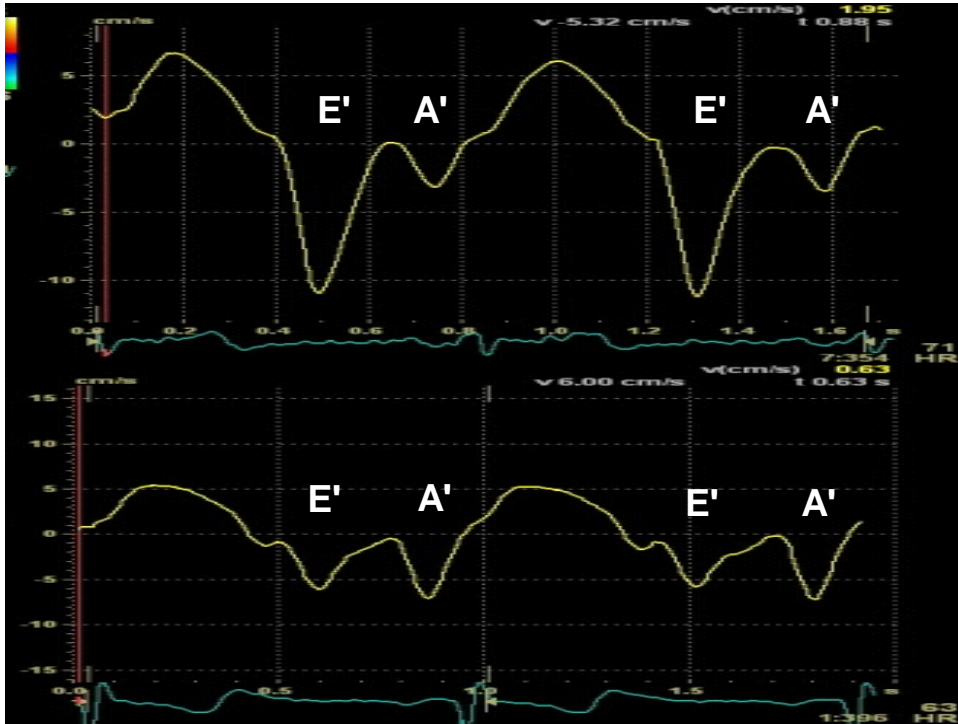
Dilated Cardiomyopathy



Echocardiography



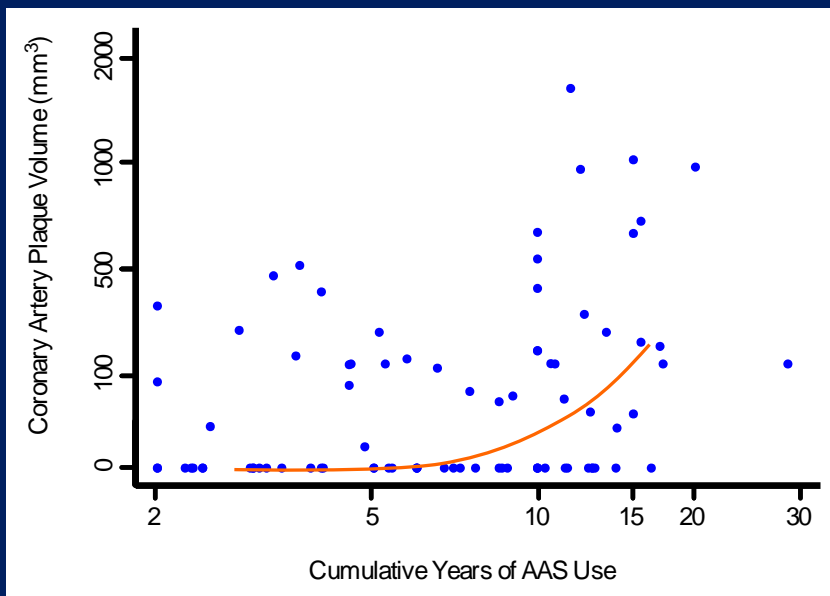




Coronary CT Angiography

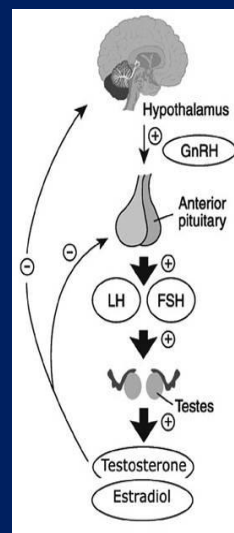


CT Angiography: Non-calcified plaque in right



Persistent Hypogonadism

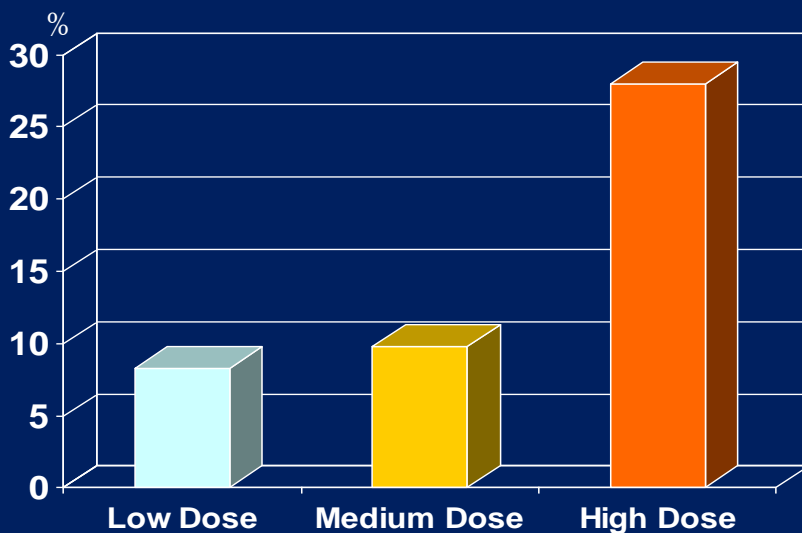
- In males, exogenous AAS suppress the hypothalamic-pituitary-testicular axis.
- If a man stops AAS after a prolonged “cycle,” he will likely be hypogonadal.
- Hypogonadism may resolve within weeks, but can persist more than a year.



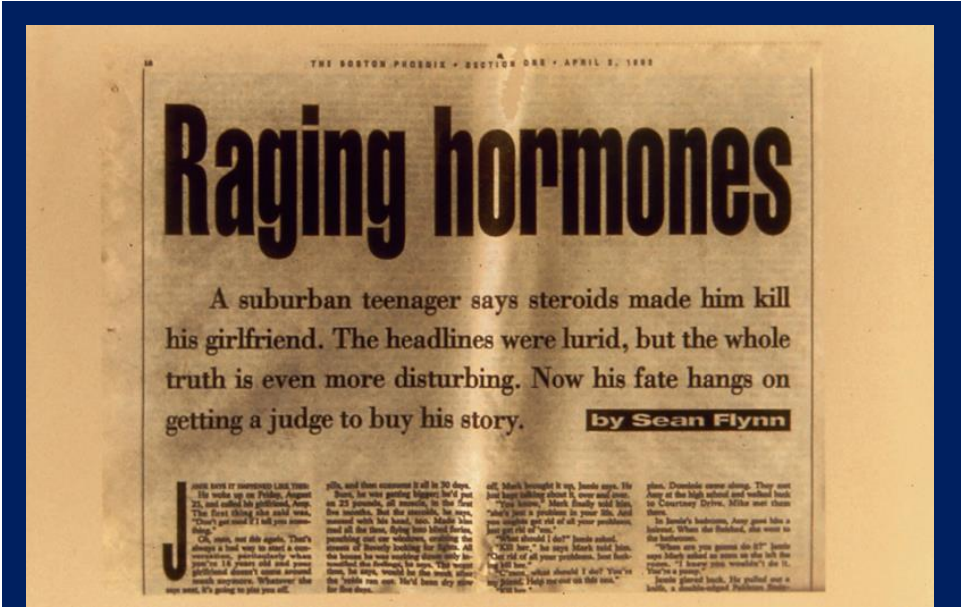
Psychiatric Disorders

- Hypomanic or manic episodes during AAS exposure
- Major depression during AAS withdrawal

Manic or Hypomanic Episodes in Steroid Users



Pope et al., Arch Gen Psychiatry, 1994



USA, 1992

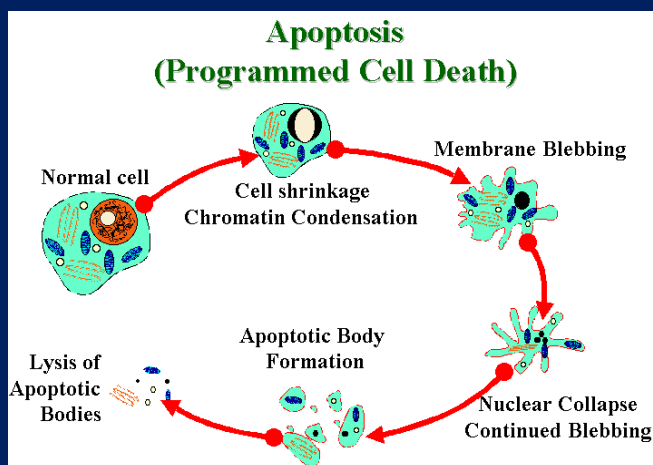


NORWAY, 2011

Major Depressive Episodes

- Usually associated with hypogonadism during AAS withdrawal
- Affects only a minority of users
- In rare cases may lead to suicide

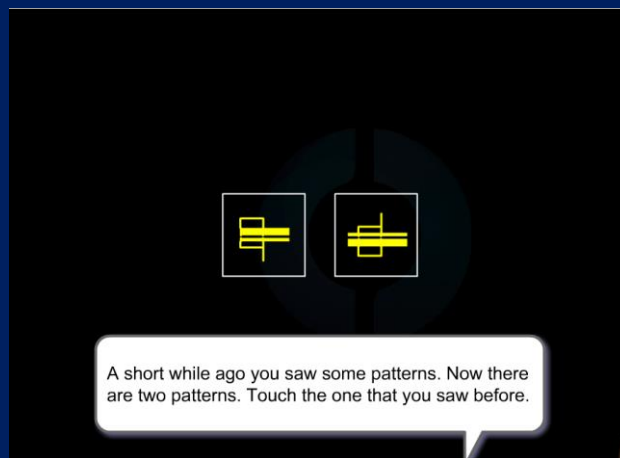
AAS-Induced Apoptosis: Programmed Cell Death



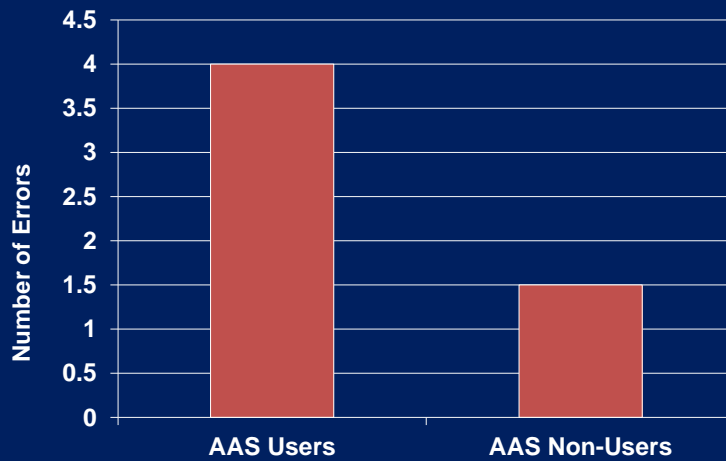
Study Participants

- Long-term AAS users (at least two years of total lifetime AAS use), **N = 22**
- Short-term AAS users (less than two years of total lifetime AAS use), **N = 9**
- Experienced weightlifters reporting no AAS use, **N = 13**

Pattern Recognition Memory

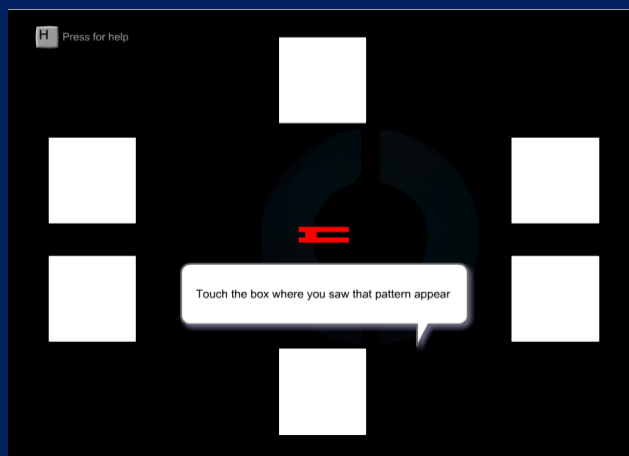


Pattern Recognition Memory, Errors

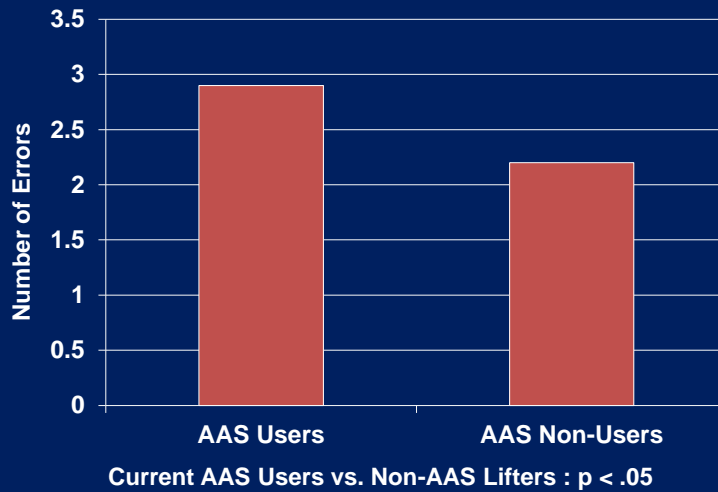


Long-Term AAS Users vs. Non-AAS Lifters : $p < .05$

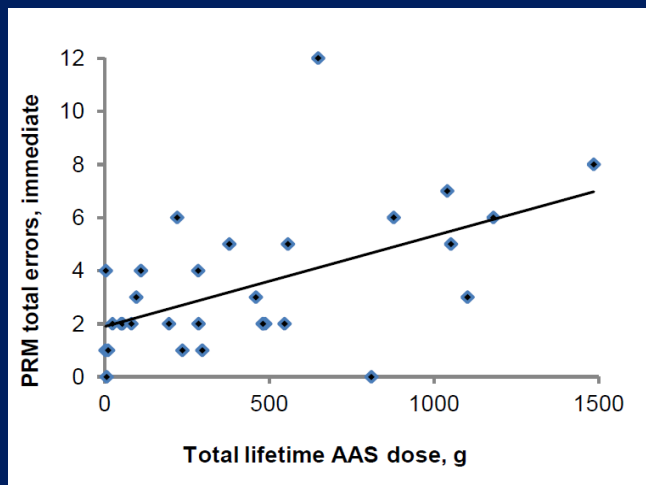
Paired Associates Learning, Errors



Paired Associates Learning, Errors

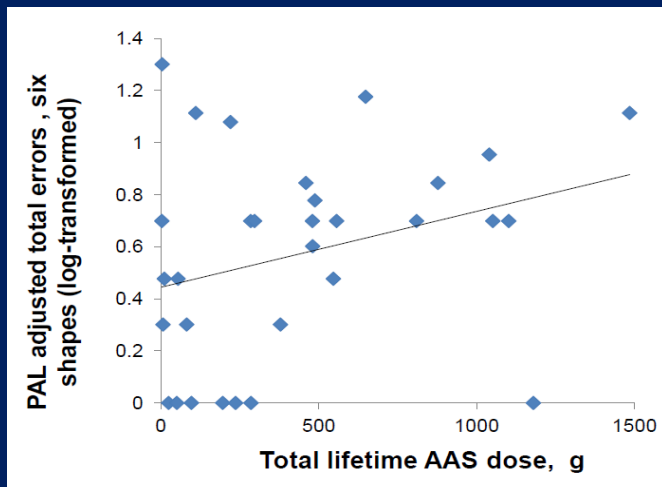


Pattern Recognition Memory, Errors



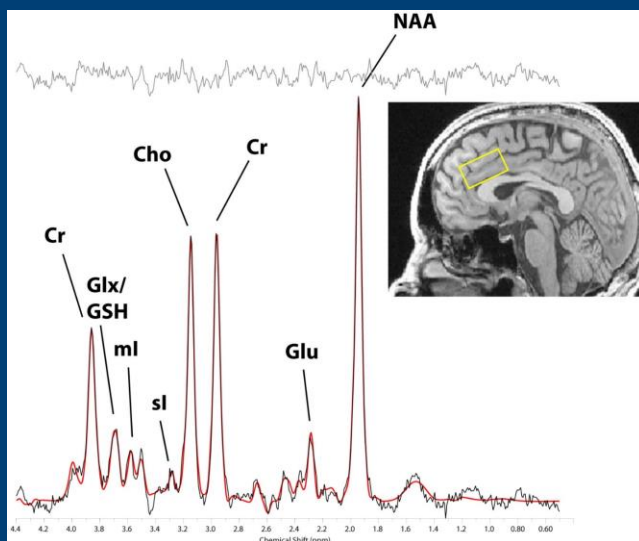
PRM Errors vs. Lifetime AAS Dose: $r = 0.54$; $p = 0.002$

Paired Associates Learning, Errors



PAL Errors vs. Lifetime AAS Dose: $r = 030$; $p = 0.10$

Magnetic Resonance Spectroscopy



Kaufman et al., *Drug Alcohol Depend*, 2015

A Looming Public Health Problem?

- Widespread illicit AAS use did not begin until about 1980.
- Therefore the leading edge of the population of illicit AAS users – those who first tried steroids as youths in the 1980's – is only now reaching middle age.

A Looming Public Health Problem?

- Imagine that widespread cigarette smoking did not arise until 1980, and that the great majority of cigarette smokers were still under age 50 today...
- An analogous situation might presently exist for AAS.