Effect of steroids and exercise on muscle mass and strength

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The use of anabolic steroids has been observed in essentially all levels of sport – from the high-school football team to professional sports. In professional body building, steroid use is as much part of the sport as is the training, tanning, and body waxing. Rumors also swirl around male Hollywood actors who must get in incredible shape to convincingly play a superhero within tight timelines.

Have you ever wondered how much of an advantage steroid use provides when it comes to body composition, muscle mass, and athletic performance?

For instance, does simply taking exogenous testosterone and sitting on the couch turn you into The Rock?

Conversely, can you ever look like Arnold by training for hours every day, but omitting the steroids?

The answers to these questions may surprise you.

One of the best studies on this fascinating topic was conducted over 20 years ago by Bhasin and colleagues and published in the *New England Journal of Medicine*.

The protocol of this study was beautiful in its simplicity.

A group of 43 normal men (as in not athletes) between the ages of 19-40

years were randomly assigned to one of four groups: placebo with no exercise (NoT+NoE), testosterone with no exercise (T+NoE), placebo plus exercise (NoT+E), and testosterone plus exercise (T+E).

Participants received injections of 600 mg of testosterone enanthate or placebo weekly for 10 weeks. For context, this dose of testosterone is six times higher than that usually given as replacement therapy in men with hypogonadism. The men in the exercise groups performed standardized weight-lifting exercises three times weekly.

To avoid the potential confounding of changes in diet, all men were instructed to follow a standardized daily diet with a pre-set amount of calories that were regularly tracked using diaries.

As expected, testosterone levels increased dramatically in both the T+NoE (>5-fold) and T+E groups (>7-fold). Numerically, testosterone was also increased slightly in the noT+E group (557->667ng/dl), although this was not statistically significant.

As you'd expect, due to negative feedback of all that excess testosterone on the hypothalamic-pituitary system, levels of luteinizing hormone (stimulates endogenous production of testosterone) and follicle stimulating hormone (stimulates sperm production) were significantly reduced in both T groups. This explains why steroid users can become infertile while taking steroids, and why they experience a drastic crash of testosterone levels upon stopping the injections (the body's own testosterone production gets essentially shut off).

Here's where things get interesting.

Men treated with testosterone who did not work out (T+NoE) gained nearly double the muscle mass as did those who received placebo injections but regularly exercised (NoT+E; 3.2 kg vs 1.9 kg increase). Of

course, the increase in muscle mass among the men in the testosterone-plus-exercise group dwarfed both these groups, averaging 6.1 kg.

In terms of strength, the men in the testosterone-alone (T+NoE) and placebo-plus-exercise (NoT+E) groups had similar increases in the one-rep max weights lifted in the squat (19 and 20%, respectively) and bench press exercises (10 and 11%, respectively). Men in the testosterone + exercise group basically gained double the strength increase in both the squat and bench press exercises (38% and 22%, respectively).

For someone who's been working out without the help of steroids for many years (like myself), this finding can be somewhat depressing.

Now it's not all rainbows and unicorns for the men on testosterone; acne and breast tenderness were reported by some of the men.

Moreover, it is well established that log-term use of these drugs can potentially cause serious adverse effects on the cardiovascular system, fertility, prostate, lipid metabolism, and insulin sensitivity.

The obvious takeaway from this study is that exogenous testosterone is clearly a potent stimulant of muscle growth and strength increase. Although the results of this trial may dismay you, this study helps to understand the popularity of steroid use in sport, entertainment, and even among ambitious gym rats.

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