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The Think Muscle Newsletter publishes the latest news and research on exercise physiology, dietary supplements, performance enhancement, lifestyle management, health & nutrition, and bodybuilding & fitness. The newsletter is dedicated to providing accurate and unbiased scientifically based information.

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Message from the Editor in Chief:

I had thought I heard it all until I stumbled across a recent news blurb about a new product coming out this summer. “For the sailor, no less than the hangman, hemp was indispensable”, says a 1942 film produced by the U.S. Department of Agriculture to promote hemp production for the war effort. That’s right, you read it correctly, “hemp”. Mr. Harrelson get out your blender, hemp protein powder is coming to a supplement store near you! Nutiva, a Northern California manufacturer of hemp food products, is going to introduce hemp protein powder coming in August. Hemp protein powder is about 50% fiber, and only 30% protein, so a 30 gram serving only yields about 11 grams of protein. But you get a whopping 14 grams of fiber in every glass.

Some of you may be wondering if hemp, also known as cannabis sativa L., exerts any estrogen-boosting-testosterone-suppressing activity like its sister plant marijuana. Studies have shown no observable estrogenic activity from hemp extracts, so unlike soy, hemp protein shouldn’t get you guys wondering whether you should wear a rhinestone thong for the evening judging. (No offense to any of you who have recently made that choice).

I also wanted to share a great website with anyone interested in the history of bodybuilding. Check out http://www.sandowmuseum.com It’s a beautiful site full of

photos and bios of the muscle men of years and centuries past. Credit goes to Dr. R. Christian Anderson, Ph.D for putting together such a great site.

Without further adieu,

-bryan

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ThinkMuscle Q&A

with Bryan Haycock

Question: I've recently gone back to working as a fitness trainer and had to take some seminars to get my certifications current. One of our assignments was to take an exercise and make it progressively more difficult by providing less and less stability.

In other words, I started with a DB shoulder press seated on a bench with feet shoulder width apart, followed by alternating (moving at the same time) presses, then one-armed presses. Then I did the same progression but with feet together, then the same progression with only one foot in contact with the ground. Then, I did the same progression seated on a Swiss ball. One arm DB press seated on the ball with one foot down makes the DB feel MUCH heavier...

I asked the instructor if a 5RM of the above exercise would create the same hypertrophic response as a 5RM of a traditional seated DB press. He said, "Yes, Kate, weight is not the only way to create hypertrophy."

Intuitively this does not seem right to me. Some response yes, but the same??? So what I'm trying to understand is, how does the muscle perceive load? Can altering the muscle's ability to work by challenging the nervous system cause the muscle to perceive the DB as a greater load?

-K

Answer: That's a very good question. Your instructor’s beliefs are not based on any research, or even accurate anecdotal evidence, but instead on the belief that perceived exertion is the same as actual exertion. Not only that, but also that perceived exertion is the trigger of hypertrophy.

Let start with the question of why does a weight that is unstable feel heavier? The simple answer is because of semi-involuntary muscle inhibition you have fewer muscles contracting at the same time to lift the weight. In your example of trying to press a dumbbell overhead while sitting on a rubber ball with only one foot on the ground greatly restricts the force of contraction of many muscles “trying” to participate in lifting the

weight. As soon as your brain feels the weight falling out of balance, it will shut down those muscles responsible. When you do dumbbell chest press your tyriceps are inhibited from extending the arm at full force. Why? because the would throw the dumbbell out of its plane of motion. This inhibition makes the dumbbells seem far heavier that an equivalent weight lifted with a bar, where the triceps can contract with full force without throwing the weight out of balance.

Try this example, place a chair sideways against a wall. Now stand so that your feet are not under the chair, and then bend over at the waist and rest your head against the wall so that your back is flat. Now, lift the chair and then stand up without putting the chair down. Can you do it? If you are a woman you probably can. However, if you are a man, you most likely can't, no matter how strong you are. This is an example of how balance and leverage along with brain inhibition can make something seem very heavy when in reality, it is simply out of balance.

The same type of contractile inhibition happens with grip loss or pain. If you are lifting something and you begin to lose your grip, it "seems" to feel very heavy. As well, if whatever you are lifting causes pain in your hands, the weight "feels" very heavy. Once again the brain will shut down muscle contraction in order to prevent you from losing your grip or to prevent any further pain from supporting the weight.

And to address your instructor's conclusions that weight that is difficult to balance is equally effective at stimulating hypertrophy as weight that actually "is" heavy, is simply false. Just because your brain is inhibiting contraction, and thus makes a weight "feel" heavy, doesn't mean that the actual mechanical stimulus required for hypertrophy at the cellular level is present.

And finally, to address your question about how muscle perceives load, the muscle has nerves that tell the brain how much strain/stretch is being applied to the tissues. These are found in the musculotendinous junctions. They react to both the strain created by voluntary contraction of the muscles, as well as passive stretch. Their purpose is to prevent you from hurting yourself by shutting off the signal to the muscle. This isn't exactly what happens with balance, but its close.

The other mechanism that you might be more interested in is not so much a nervous system mechanism, but instead a cellular mechanism. Muscle cells are mechanosensitive, meaning, that they are sensitive to mechanical strain (See Ingber, D. E. Cellular Basis of Mechanotransduction (1998) *Biol. Bull.* 194, 323-325; Wretman C, Lionikas A, Widegren U, Lannergren J, Westerblad H, Henriksson J. Effects of concentric and eccentric contractions on phosphorylation of MAPK(erk1/2) and MAPK(p38) in isolated rat skeletal muscle. *J Physiol*. 2001 Aug 15;535(Pt 1):155-64.; and Martineau LC, Gardiner PF. Insight into skeletal muscle mechanotransduction: MAPK activation is quantitatively related to tension. J Appl Physiol. 2001 Aug;91(2):693-702. for review) When the cells are mechanically stretched either passively or during contraction against resistance, various signaling cascades are initiated which eventually lead to the production of muscle structural proteins.

The cellular mechanisms that sense load cannot be fooled by balance. They are either supporting weight or they are not, regardless of how awkward it is for your brain to coordinate.

I hope I haven't been too wordy in addressing your question.

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Question: Hi Bryan, Bill Roberts was saying that steroids and other anabolic drugs can not take a person to any arbitrary level of LBM. He was comparing the normal genetic physique to Dorian Yates' physique. So what factors would cause Dorian to become bigger even if the same drugs & dosage/diet/training were used? It obviously has to be genetics. but what specific aspects that give him that advantage? Is it because he was born with a lot more muscle fibers and myonuclei and also has a higher natural testosterone level? Thanks, Tim

Answer: Hi Tim,

Well, genetics are "part" of it. There is a known allele (i.e. variation) of the myostatin gene that some people have. This apparently affords them faster growth from resistance training. This could play a role, however, as with other professional sports, by the time they are professionals, the non-genetically gifted group ahs already been weeded out. So, admittedly, genetics may be playing a role in how fast a person grows, particularly when it comes to Myostatin. But even in people with normal myostatin genes, myostatin is reduced by upwards of 35% just from resistance training alone. (S. M. Roth, G. F. Martel, R. E. Ferrell, E. J. Metter, B. F. Hurley, and M. A. Rogers Myostatin Gene Expression Is Reduced in Humans with Heavy-Resistance Strength Training: A Brief Communication Experimental Biology and Medicine, June 1, 2003; 228(6): 706 - 709.) But, I still feel it is an over simplification to label every variation among bodybuilders as "genetics".

When trying to figure out what is making the difference between bodybuilders you should start with those things that are most different between individuals. Keep in mind that the genetics that are involved in muscle tissue regeneration and hypertrophy are more identical between individuals that any other variable.

So the most probable factors involved in producing the differences in overall body mass you see in various professional bodybuilders are diet, training, drugs dosages and combinations, and the duration of treatment. I'll discuss each briefly.

An appropriate diet is absolutely critical for muscle growth. Insufficient calories inhibit growth by increasing catabolic activity and by directly decreasing IGF-1 whether you're using testosterone or not (Karila T, Koistinen H, Seppala M, Koistinen R, Seppala T. Growth hormone induced increase in serum IGFBP-3 level is reversed by anabolic steroids in substance abusing power athletes. Clin Endocrinol (Oxf). 1998 Oct;49(4):459-63.). I don't think its too difficult for someone to understand that a guy who is always trying to stay lean by keeping his calories/carbs really low, isn't going to have much success putting on new body mass. And like I said

just a second ago, testosterone isn't going to make a person impervious to the ravages of dieting. Even guys on multi grams dosages lose lean mass when they cut their calories too low.

Training is probably one of the most misunderstood factors when steroids are involved. This especially becomes a problem with veteran bodybuilders. They have been training the same way and using steroids for so long they are completely stalled out. Sure, they're big, but they don't grow from month to month or even year to year. What allowed them to grow when they were rookies, and still increasing the dosages, simply doesn't do the trick anymore. This is mostly because their training was inefficient to begin with, and the level of androgens their maintaining isn't sufficient to support more mass anyway.

About the amount of drugs used, there comes a point where, all things being equal, the higher the level of testosterone use, the more overall body mass one can maintain. The anabolic properties of androgens are dose dependant. (See Bhasin S, Woodhouse L, Casaburi R, Singh AB, Bhasin D, Berman N, Chen X, Yarasheski KE, Magliano L, Dzekov C, Dzekov J, Bross R, Phillips J, Sinha-Hikim I, Shen R, Storer TW. Testosterone dose-response relationships in healthy young men. Am J Physiol Endocrinol Metab. 2001 Dec;281(6):E1172-81.; and Woodhouse LJ, Reisz-Porszasz S, Javanbakht M, Storer TW, Lee M, Zerounian H, Bhasin S. Development of models to predict anabolic response to testosterone administration in healthy young men. Am J Physiol Endocrinol Metab. 2003 May;284(5):E1009-17.) We know for sure it is up to 600 mg/week without showing any signs of diminishing returns so I estimate it would continue until about 1,000mg/wk, but I'm speculating on that figure. Still, from the research we have, you get (all things being equal) about 3 pounds (1.5 kg) of fat free mass for every 100mg of testosterone per week up to at least 600 mg/week over the course of about 16 weeks of use. And like I said, the dose response showed no signs of attenuation, it was linear through 600 mg/week. And this is without any exercise or mass gaining diet! So clearly, drug dosages make a big difference.

As far as drug type and combinations go, it is well known that the testosterone esters elicit the greatest increases in circulating GH and IGF-1 levels, where as steroids that don't aromatize do not have any GH or IGF-1 boosting effect and thus are inferior mass building drugs. The proper use of GH, ephedrine, and Cytomel can also allow higher caloric intakes without concomitant fat gain.

And finally, duration of treatment. Simply put, the longer your physique is under the influence of high androgens, and hypertrophy-specific training and dieting practices, the bigger you will grow. We're not talking weeks or months here. We're talking years. Granted, after using androgens for several months, you reach a quasi "steady-state", meaning, your system normalizes, although at a higher body weight. This is when and why it is important for any top level bodybuilder to continue to try to make his/her training as effective as possible.

So, to make a short story long, all of these variables, not to mention age and musculoskeletal structure, contribute most heavily to the differences you see in today's pro bodybuilders. However, there are indeed genetic differences that we are only now

beginning to investigate. These differences involve androgen receptors primarily, but will also involve satellite cells and of course myostatin (GDF8).

Question: I wonder what you think about HST for a woman. Do you have any special hints? Any suggestions? …I'm doing ACT and I'm on TKD. In two weeks I want to start building some muscle - that's why I consider HST. I know that it may be tough stuff to build some muscle on low-carb but I'll try. All in all, I will be grateful for any piece of advice from you.
Greets and best wishes,

-G

Answer: There are gender differences in the response to resistance exercise, however, that doesn't mean that a women would want to do anything other than HST if she is interested in building some muscle.

It has been shown that females usually experience less hypertrophy than men do, in response to a resistance exercise program. It is also known that women experience less microtrauma to their tissues than men after resistance exercise. Though it isn't exactly clear why women experience reduced muscle damage after exercise it is believed to be related to estrogens and some protective effect they may exert. The jury is still out on the exact mechanism.

Anyway, as to whether HST is appropriate for women, absolutely. HST is the most efficient way to train for muscle size. Keep in mind that even small muscle benefit aesthetically from some development, so concerns about "getting too big" are unwarranted, particularly when it pertains to women.

I personally train a few women with HST and the results have been equally positive as with my male clients. There are also several women who have reported great results on the HST message board (http://www.hsnhst.com/cgi-bin/ib3/ikonboard.cgi?s=d1ad5f63b13e0319fef3531b0887cf44;act=ST;f=14;t=1086;hl=women) That's a pretty big link. If it doesn't work, try http://www.hsnhst.com/cgi-bin/ib3/ikonboard.cgi)

It's true that women struggle with lower body fat, but men have their problem areas as well. Both are addressed in the same way so no change in approach is called for between men and women as far as fat goes. The same is true for muscle groups; both men and women will do the same things to get them to respond to training.

I would say however those although HST is your best bet for training while using a ketogenic diet, don't expect to put on any muscle. You may be able to keep what you

have, but a ketogenic diet creates changes in the muscle itself that inhibit growth. You may try alternating carb days or something, just to increase your carbs a bit “if” building muscle is your goal.

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Be on the Cutting Edge!

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Reader Survey
Tell Us What You Think?

1. Message from the Editor in Chief:
[ ] It was good.
[ ] It was okay.
[ ] I didn't like it.
[ ] I'm not interested.

2. Q&A: Balance and muscle growth
[ ] It was good.
[ ] It was okay.
[ ] I didn't like it.
[ ] I'm not interested.

3. Q&A: Why some Pros are huge and others are less huge
[ ] It was good.
[ ] It was okay.
[ ] I didn't like it.

[ ] I'm not interested.

4. Q&A: HST for women
[ ] It was good.
[ ] It was okay.
[ ] I didn't like it.
[ ] I'm not interested.

5. What type of articles would you like to see in the future? (Check all that apply.)
[ ] Anabolic Steroids and Pharmaceuticals
[ ] Anti-aging medicine
[ ] Body Transformation
[ ] Children's Health and Nutrition
[ ] Competitive Bodybuilding
[ ] Diet and Nutrition Reviews
[ ] Dietary Supplements
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[ ] Fitness Competitions
[ ] Fitness Psychology
[ ] General Health Topics
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[ ] Powerlifting
[ ] Seniors Health Topics
[ ] Sports Specific Training
[ ] Women's Health and Nutrition

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I hope you have enjoyed the latest issue of the Think Muscle Newsletter. Suggestions? Comments? Questions? I'd love to hear them!

Best regards,

-bryan
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