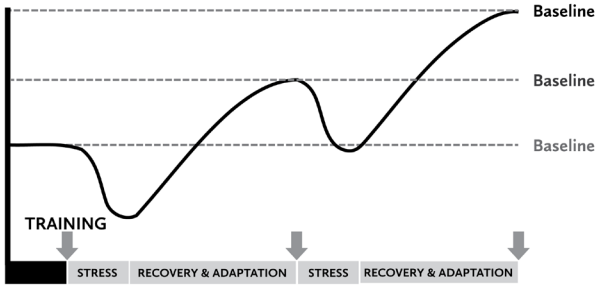
Starting Strength

It's Time to Stop Talking About "Supercompensation"

by

Jonathon Sullivan and Mark Rippetoe

In Part III of their new book, *The Barbell Prescription: Strength Training for Life After Forty*, Jonathon Sullivan and Andy Baker discuss Hans Selye's General Adaptation Syndrome and the training model that proceeds from it – the Stress/Recovery/Adaptation Cycle. In the initial drafts of this manuscript, Sullivan and Baker discussed the cycle, or overload event, in the way most other people do, by including the concept of "supercompensation." In the widely-cited model, the delivery of a training stress disrupts homeostasis and forces the athlete into the cycle. He must recover from and adapt to the training stress. At the zenith of this cycle, the athlete is said to be in a transient state of "supercompensation," in which he displays an improved performance capacity. Another training stress should be delivered at this point, to drive re-entry into the training cycle. This is the foundation of the current explanation of *progressive overload*.



At a final pre-publication meeting of Rippetoe, Sullivan, Baker, and Bradford, at the Starting Strength Coaches Association Conference in August of 2016, this topic (and quite a few others) became a point of serious and animated discussion over beef and booze. Additional conversations between Rippetoe and Sullivan took place over telephone. And in the course of these conversations, and after a lot of deliberation, we have come to the following conclusion:

It's time to stop talking about "supercompensation."

Why? Because the concept doesn't add anything useful or illuminating to the Stress/Recovery/Adaptation model. More importantly, the "supercompensation" concept implies processes and qualities that have never been demonstrated and which do not comport with our current understanding of living systems.

The term "supercompensation" appears in the biomedical literature in the early twentieth century, not in the context of physiology, but in the context of philosophy and psychoanalytic theory – and that, right away, should raise a red flag. In any event, the term was first appropriated in English by

physiologists in 1950, to describe changes in muscle glycogen content during recovery from different workloads. "Supercompensation" was the term chosen to describe the phenomenon whereby the glycogen depletion following high-intensity work was followed by a subsequent increase in muscle glycogen content over baseline. (In the case of the seminal article, the "work" performed was induced electric current applied to an in vitro frog leg preparation. It is not clear whether the investigators used a white wine sauce or a simple butter reduction, but we're sure it was delicious.)

The use of the term "supercompensation" since then has mostly been in the context of muscle glycogen stores, which are increased over baseline after heavy work, for reasons that should be clear to anybody with a passing knowledge of the Stress/Recovery/Adaptation principle, inventory management, or just plain old common sense. In retrospect, the term seems unfortunate, especially as applied to training theory, because it implies that the organism is doing something special, or perhaps even magical.

But this is not so. The organism isn't *super*compensating. It's just compensating, or, as we would prefer to put it, it's just *adapting*.

An example would seem to be in order. Let's say that you are a novice trainee, about two weeks into your program. You have a Starting Strength Coach, so you're not fucking it all up. You come to the gym, you do the program as written, and you attend to your diet, sleep, and all other recovery factors. At your last workout, you completed work sets of 185x5x3 in the squat. That was three days ago. Today, you will squat 190x5x3.

It's pretty clear that you had the capacity to squat 185x5x3, not least because you actually did it. Your previous training, your diet, your genetics, and your biology had all adapted you to that level of performance. If we asked you to do it again today, you could clearly accomplish this task, although obviously that would be a waste of your time. You were able to perform this work on Monday, and you're able to do it today.

But there is nothing mathematically precise about this level of adaptation. Your body isn't a computer, or a calculator, or even a fine example of German engineering, even if your name is Hartmann. You're a living system, and your various performance capacities all occupy ranges, rather than discrete values. Some of these ranges, like the mobility of your knee joint or your visual acuity, are more tightly constrained than others, of course. But your ability to produce force is a slightly "fuzzy" value, and is affected not just by structural parameters but also neuromuscular efficiency, metabolic status, mood, time of day, and so on.

So on Monday, you squat 185x5x3, your new personal best, and you're happy with that. But do you really think you could *not* have put up 187.5x5x3? Or even 190? There is an excellent possibility that you could have. Because even though you've been taking and adapting to 10- and then 5-lb jumps up to this point, your body hasn't been putting this data into a spreadsheet or doing an explicit calculation to prepare you for the next bout.

You were adapted to work sets at 185 on Monday, so they got done, but your capacity on the squat wasn't a number, it was a *range* around that number. (Obviously we're concerned with the range above that number, since it's obvious that lighter weights can be done.) With just a bit more effort, you could have done 187.5 or 190, because you're a novice, and your capacity is less well-defined – the "fuzzy zone" is broader – than that of an advanced or elite athlete, who works far closer to his physical potential than you do.

The program, not some number-crunching by your ribosomes, called for 185 on Monday, and the program, not some calculation by your essence vitale, calls for 190 today. Since Monday, you have adapted to a training stress imposed by the workout at 185, an adaptation that *includes* the ability to

do 190. The stress, and then the recovery and adaptation – the overload event – have brought you to a new performance level, where you *can* do 190x5x3. But you could almost certainly do 195, or 200, perhaps even 205 if your life depended on it.

Where is *super*compensation in all of this? There's nothing super about it. You just adapted. You didn't super-adapt. You initiated an overload event, and your body has recovered and brought you to a new level of adaptation, which we will call 190x5x3 but which actually entails a range of performance that extends somewhat beyond that value – because your myocytes can't count.

To call this "supercompensation" suggests that there is something extraordinary or even magical, preternatural, spooky, or weird about it. But nothing of the sort has ever been demonstrated. "Supercompensation" suggests that the cells of your body have collaborated communally to perform a calculation that results in a precise amount of overshoot – 2.6% – in adaptation, because it just knows that you're stupid enough to do this shit again and 2.6% should be about right. Adaptation to training stress is a marvelous gift, there for us to exploit, but it's a gift of nature, not of the occult, and not of the University either.

During the Stress/Recovery/Adaptation cycle, everything that happens is actually pretty mundane. The overload event disrupts homeostasis and imposes a certain amount of tissue and metabolic stress. Hormonal, genetic, and cellular responses come to the rescue immediately. Cytokines and signaling systems sound the alarm. Neuroendocrine responses compel the athlete to slow down, sleep, eat and hydrate. Ribosomes do what they're programmed to do, translating instructions on mRNA into new proteins. And so on. It's not supernatural, it's not really super-efficient, it's not super-special – it's not super-anything. It's just adaptation to stress, which is something that organisms have been doing as part of the workaday business of survival for about 4.1 billion years.

Nobody to our knowledge has ever demonstrated that the biological processes supporting adaptation during the overload event exceed the commonly observed capacities or tolerances of these processes. Ribosomes don't get smarter or faster or more accurate, cytokines don't carry secret messages they couldn't before, and the athlete doesn't grow a spidey-sense or the ability to shoot webs out his arse. It's all very prosaic, actually.

We might forgive all this if the concept of "supercompensation" elaborated the model in a useful way and gave us a better idea of how to train productively. But it doesn't. The concept of adaptation is all that's needed. Go to any training model that invokes "supercompensation" and replace the term with "adaptation."

What changes? Nothing, except the inclusion of a term and a concept that, now that we all think about it, seems a bit silly, and probably should have all along.

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