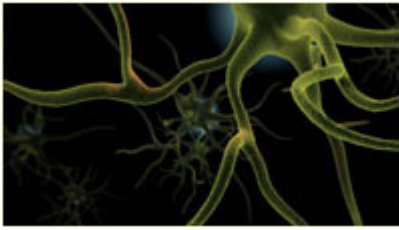


A Scientific Application of Tapering to Maximize Performance for the Elite Athlete Part 3



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Abstract

According to the fitness and fatigue model of performance, tapering—which involves a systematic decrease in load—is optimal to facilitate a physiologic fitness peak.

Total load can be described as a combination intensity, volume, duration, and frequency. Therefore, it is the manipulation of these variables that will ultimately determine the outcome of a peak cycle. The purpose of this paper is to provide an overview of the optimal protocol for tapering. Special emphasis will be placed on direct practical implications such as tapering before a competition, during a season, prior to a bodybuilding contest, and maintenance.

Introduction

Zatsiorsky (1995) suggested that 'unlike intellect, long breaks ruin physical fitness. Such occurrences further lead to wasted time spent on recovering pre break fitness, when time could have been spent improving. If you want to scale a mountain, why go half way up, go back down and climb again!? The Laws of physical training must be obeyed if success is to be achieved. The Law of Continuous Training is one such law.'

Here, Zatsiorsky refutes the common mantra which states that extended periods of time off enhance performance. The encyclopedia Britannica (2005) defines a mantra as a sacred utterance (syllable, word, or verse) that is considered to possess power. Various mantras are either spoken aloud or merely sounded internally in one's thoughts, and they are repeated continuously for some time or just sounded once, with the hope that the phrase will come true. The phrase, 'He just needs time off' clearly falls under this frame work. However, merely repeating a phrase holds little weight. In reality, it is what is actually suggested by the scientific evidence that counts. Wilson and Wilson (2005, a, b) found that instead a systemic decrease in overload to facilitate a physiologic fitness peak was optimal. Building off their work, the following paper will provide an overview of the optimal protocol for tapering. The

following recommendations apply to healthy participants. For recommendations involving pathological conditions, see King (2004, injury section of abcbodbuilding).

Overview of Tapering Part I and II, A summation of The Evidence

The following section will provide an overview of the basis for the taper, as well as how to optimize such a procedure. The overview summates Wilson and Wilson's (2005, a, b) dissertation on tapering.

Hull (1943, 1952) was one of the first to investigate the effect of fatigue on performance. He found that practice with a greater work than rest period led to decreased performance. However, with a period of lowered practice, performance again rose, suggesting that fatigue was masking the positive adaptations achieved by training. Building on the work of Hull (1943), Banister et al. (1975) introduced the two factor theory of performance. Banister et al. (1975) suggested that an organism should be viewed as a system which receives input in the form of training, and produces output in the form of performance. The model suggests that the duration and intensity of training, termed training impulse, effects the system by causing a fatiguing and fitness effect. In this context, performance is calculated by subtracting the negative fatiguing impulse from the positive fitness impulse.

Generally fatigue is thought to have a two fold higher initial amplitude or effect on the organism than fitness. However, the positive fitness adaptations obtained from the training impulse last three times longer than the fatigue. Tapering protocols are implemented to take advantage of the differences in these decay constants. Because fatigue dissipates faster than fitness, a relatively short period of lowered volume in training can remove the fatigue, while maintaining positive adaptations.

Duration

Studies discussed in the Wilson and Wilson (2005, a) paper found significant increases in performance ranged from 1 to 5 weeks of taper duration. These data roughly fall within the ranges of mathematical models provided by Mujika (1996) in which the optimal taper ranged from 12-32 days, the estimates by the Fitz-Clark et al. (1991) mathematical model that found optimal taper duration to be between 16 +/- 6 and 40 +/- 8 days, as well as the Zatsiorsky range of 2-6 weeks duration.

While the exact duration of taper which elicits a detraining effect is not precisely known (Mujaki, 2000), Kubukely et al. (2002) suggests that both the intensity and duration of previous training effect the time needed to dissipate fatigue. In this context, Zatsiorsky (1995) suggests that training periods containing numerous shock cycles and long duration should last on the upper range of duration, and lower volume moderate training phases on the lower end. As a minimum, Kubukely et al. (2002) recommends a 2 week taper for extremely hard and long previous training phases, while lesser tapers (i.e. 6-10 days) should be used for lower volume, and duration training phases.

Based on this data, the current authors advice the following:

- If accumulated fatigue is high, such as after a 15 week training season, the duration of the taper should last a minimum of two weeks, and an upwards of five.
- If accumulated fatigue is minimal, such as after a four week training session, then the duration of the taper should last a minimum of one week, and a maximum of two weeks.

Overload

Evidence suggests that complete cessation of training will invariably lead to a decline in performance. According to the fitness and fatigue model of performance, tapering—which involves a systemic decrease in training load—is optimal to facilitate a physiologic fitness peak.

Overload occurs when the magnitude of training load is above habitual levels. It can come in the form of a greater intensity, increased volume, or increased frequency—and each should be utilized. However, intensity appears to be the factor, which causes the greatest regression in the individual when lowered. That is, both frequency and volume are vital when overloading the system, but intensity appears to be more important when maintaining adaptations.

Intensity can be defined as the percentage of a maximal effort—such as, a one repetition maximum, $\dot{V}O_2$ maximum, or heart rate maximum. Evidence suggests that the participant must maintain their original intensity, in order to preserve fitness gains. Therefore, if an individual usually lifts at 6 repetitions for squats, they should maintain that lift during their taper. As an illustration, if on most weeks the individual squats 400 pounds for a rep scheme of 10, 8, 6, and they decide to drop this down to 300 during their taper, they would lose a significant amount of adaptations, and very rapidly.

Volume can be defined as sets multiplied by repetitions; when the objective task requires the participant to carry his or her own body over long distances, such as in swimming, bicycling, and running, then volume can be defined as the distance covered, or duration of the activity

Frequency can be defined as the number of training sessions over a period of time.

During a taper, intensity must be maintained or increased for the retention or improvement of training-induced adaptations. However, volume and frequency should significantly be reduced in order to dissipate fatigue.

The current authors advise the following:

- Training intensity should always be maintained or improved during a taper.
- Frequency should be decreased by no more than 20%.
- Volume should be reduced by 50-85%, depending on the accumulated fatigue. If the athlete trains for only 4 weeks, and the fatigue is minimal, volume should be closer to 50% in reduction. If the accumulated fatigue is high, such as after a 15-week training season, volume should be closer to an 85% reduction.

Type of Taper

A taper can be performed four ways:

- Step taper—load is immediately dropped. For example, if the athlete plans to reduce volume down to 30%, this would be done on the first day of the taper, and then maintained for the duration of the taper.
- Linear taper—load is progressively reduced in a linear fashion. For example, lowering volume 10% everyday until the desired reduction is achieved.
- Exponential (slow decay) taper—load is non-linearly reduced, with a slow decay rate.
- Exponential (fast decay) taper—load is non-linearly reduced, with a fast decay rate.

There is an inadequate amount of studies on this topic; and the few studies that have been done are flawed. Thus, the current authors cannot concretely recommend the exclusive use of a step, linear, or exponential taper.

Applying the Taper

The following sections will suggest various situations in which the taper can be applied, and give recommendations for each situation. Practical applications will include recommendations of duration and total load. The type of taper to perform (I.e. step or exponential) will not be advised, as the current scientific evidence is unclear on the matter. Therefore, this decision is arbitrary to the athlete. All types of tapers, however, have been used with significant increases in performance.

Pre-Competition

Prior to a competition, a taper should be applied to maximize performance. The type of taper is dependent on the accumulated fatigue. For example, a group of Olympic strength training athletes, after training for 15 weeks, twice a day, 6 days a week, at 50 sets a day, would have a high accumulated fatigue. The authors would, therefore, advise them to lower volume to 12 + - 3 sets per day (approximately an 80% reduction in training volume) and reduce frequency to 5 days a week, or reduce training twice a day, to once a day, twice during the week. The duration of the taper should last a minimum of two weeks, and an upwards of five.

Bodybuilding is a very unique sport, in that performance is not only based on extreme motor skills (i.e. posing) but also, aesthetic presentation (muscularity, symmetry, separation, etc.). However, in order to maximize muscularity, a taper may be of extreme benefit, if used correctly.

For example, Trappe, Costill, and Thomas (2000) performed an excellent experiment to examine the changes in whole muscle function and single cell contractile properties of Type I and II muscle fibers from the deltoid muscle of highly trained swimmers before and after a 21-day reduction in training volume, while maintaining their intensity. Results found that whole muscle power increased 17% and 13% on the swim bench and swim power tests respectively; Type IIa fibers were 11% larger; peak force increased significantly in fast twitch fibers; and shortening velocity was

32% and 67% faster in the Type I and IIa fibers, respectively. Further, a previous study by Trappe et al. (1998) of the same protocol, showed almost identical results.

The current authors, therefore, recommend the following:

- The athlete should be in top flight condition 6-8 weeks prior to the competition.
- Next, the athlete should undergo a two week taper, with a 75% reduction in training volume, and no more than a 20% reduction in frequency. This should be satisfactory to regain or actually improve on fullness, and hardness, and quality, lost through dieting, with minimal gain in adipose tissue.
- The athlete will then have 4-6 weeks left before the competition. The next 2-4 weeks should be used to again maximize muscular separation through diet and exercise.
- During the final 2 weeks, the athlete should follow the protocol advised by Wilson (2003) [Pre Contest Week - An In Depth Analysis](#).

Following the taper, fatigue should be minimized. The 2-4 week meso-cycle, prior to the 2 week pre-competition dieting protocol, should not significantly alter the benefits achieved from the taper. Moreover, the pre-contest program prescribed by Wilson (2003) has a tapering component to it that should facilitate a peak in performance.

In Season Training

The taper may also be used mid-season to limit the accumulated fatigue and maximize performance. For example, during a 3 month season, participants may taper mid-point of the season.

Priority Principle

During a given mesocycle, athletes often choose to prioritize a certain skill or component of their sport. For example, a bodybuilder may increase training load on their quadriceps, calves, and forearms. However, in order to accomplish this, other body parts must be reduced in total training load. For such a protocol, the principles of tapering should be applied. For instance, if the participant is tapering back on their biceps, and their normal load was training biceps once a week and 25 sets per workout, the current authors would advise them to lower this by a minimum of 50 percent (approximately 12 sets), while maintaining intensity, and frequency. In this case, the participant may consider even increasing frequency, while lowering volume up to 75% (approximately 6 sets per workout).

Overtraining

If the athlete is in a state of overtraining, a taper could be of immense benefits. It should again be applied according to the above recommendations. For more information on this topic, refer to King (2004), [An Investigation of the Psychophysiological Mechanisms of Sport Injury](#).

Vacation

Simply put: don't take a vacation from training! Find a gym that is in your hotel, and follow the principles of tapering. Any other protocol is inferior and will lead to a reduction in performance.

Introduction to Periodization

Periodization can be defined as the organization of training programs into various smaller training segments. The principles attained through the tapering model presented provide the bases for this method of scheduling. The Journal of Hyperplasia Research will dedicate an extensive amount of research to this subject in the near future—stay tuned.

Conclusion—Enter Into His Rest...

Exodus 20:8-11 states that the seventh day of the week, Saturday, was the day which the Lord selected as the day of rest and worship. Such a day would allow the saints to dissipate the reactive inhibition, and envelop themselves in the Lord. This is why Christ said: "The Sabbath was made for man, and not man for the Sabbath." – Mark 2:27.

In Deuteronomy 5:15, we read: "And remember that thou wast a servant in the land of Egypt, and that the LORD thy God brought thee out thence through a mighty hand and by a stretched out arm: therefore the LORD thy God commanded thee to keep the sabbath day." This verse speaks of redemption, which is why the apostle Paul stated in Colossians 2:17 that the Sabbath was, "a shadow of things to come, but the substance is of Christ."

Indeed, the Sabbath was a shadow of the redemption that would be provided in Christ. This is the ultimate taper—a rest that will last for all eternity—don't miss out.

Hebrews 4:1-11

1 Let us therefore fear, lest, a promise being left us of entering into his rest, any of you should seem to come short of it. 2 For unto us was the gospel preached, as well as unto them: but the word preached did not profit them, not being mixed with faith in them that heard it. 3 For we which have believed do enter into rest, as he said, As I have sworn in my wrath, if they shall enter into my rest: although the works were finished from the foundation of the world. 4 For he spake in a certain place of the seventh day on this wise, And God did rest the seventh day from all his works. 5 And in this place again, if they shall enter into my rest. 6 Seeing therefore it remaineth that some must enter therein, and they to whom it was first preached entered not in because of unbelief: 7 Again, he limiteth a certain day, saying in David, To day, after so long a time; as it is said, To day if ye will hear his voice, harden not your hearts. 8 For if Jesus had given them rest, then would he not afterward have spoken of another day. 9 There remaineth therefore a rest to the people of God. 10 For he that is entered into his rest, he also hath ceased from his own works, as God did from his. 11 Let us labour therefore to enter into that rest, lest any man fall after the same example of unbelief.

Keep it Hardcore,

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