

Taper vs. Training

What Happens During Taper

During taper, an athlete's VO₂ max increases. A person's VO₂ max – also known as maximal oxygen uptake – is the measurement of the maximum amount of oxygen a person can utilize during intense exercise. It is oftentimes used to measure an athlete's aerobic endurance and cardiovascular fitness. Having a high VO₂ max is obviously very important for swimmers' performances. Although it is extremely difficult to test a swimmer's VO₂ max because the measuring equipment does not work well in water, taper has been proven to increase the VO₂ max for athletes in other endurance sports.

Another physiological change that happens to athletes during taper is that their anaerobic thresholds increase. The anaerobic metabolic pathway does not rely on the presence of oxygen; instead, it breaks down glucose for energy and produces by products of lactate and hydrogen ions (which create an acidic environment). Lactate threshold levels are determined by how well a swimmer's body clears the hydrogen ions that are created. The faster the speed, the higher the rate of energy breakdown with subsequent higher levels of lactate. To find the maximum speed without overloading the body with acid, the goal is to improve the body's ability to get rid of the lactate and hydrogen ions as quickly as possible once it starts to form. However, most people generate a lot more lactate than they are capable of clearing at high intensities. The point at which the body cannot clear these metabolic waste products as quickly as they are made represent the actual anaerobic threshold.

When you are not exercising or are doing low-intensity work, you are almost always primarily using your aerobic metabolism. However, when you use a lot of power over a short period of time and your body's aerobic system can no longer meet your body's sudden energy demand (like during fast swimming), you rely on your body's anaerobic metabolism. During taper, your anaerobic threshold increases, meaning that your body is able to exercise at higher intensities for a longer time without having to slow down to keep up with metabolic clearance.

This is what allows tapered swimmers to be so explosive and have more "easy speed" where you can hold near top speed for longer.

Studies have also shown that tapered swimmers are able to produce more muscular power in the water than their non-tapered counterparts. A study conducted on twelve college swimmers tested the athletes before and after tapering for their end-of-season meet. For the study, the swimmers were tethered to a system of weights, and their power output was measured. The study showed that their "power during a tethered swim increased significantly by 5 percent with taper." Although this is just one study, the findings would explain the increased performance seen by tapered swimmers, as being able to produce more muscular power in the water would almost certainly lead to faster swimming.

Another thing that happens to your body is that muscle damage from the repetitive contractions and extreme stress experienced during training fully heals during taper. This phenomenon makes your muscles stronger because your body rebuilds these damaged muscle fibers stronger than they were before. However, this rebuilding process often makes you feel sore and tired.



Volume versus Intensity in Training of Competitive Swimmers (Scientific Research Paper)

It is concluded from the results of the present study that over a period of 4 weeks both training programs improved aerobic endurance capacity. The high-training volumes usually used in the training of competitive swimmers are not advantageous compared to a high-intensity training of lower volume. Therefore, it seems plausible that relevant adaptations may be reached more economically and, thus, time could be saved for other relevant training contents.

Exercise training is mainly characterized by intensity, duration and frequency of training stimuli [16]. An adequate combination of these characteristics is a prerequisite for efficient training. This combination is dependent on the duration and, therefore, on the metabolic requirements of discipline-specific competition. Swimming competitions usually last between 22 s and about 15 min (50-m – 1500-m events) and metabolic demands are mainly covered by anaerobic as well as aerobic glycolytic pathways [26]. Compared to the relatively short competition times, training volume is usually very high [22]. A main part of this high-volume swim training is usually performed in the low-intensity range [17,22]. In view of the demands of competitive swimming, particularly 50-m to 400-m events, a lower overall training volume with an emphasis on high-intensity training bouts seems to be an alternative. A recent review [9] analyzed ten studies with highly trained cyclists and runners. These authors concluded that nowadays elite endurance athletes can improve their discipline-specific performance mainly by high-intensity interval training. High-volume training does not result in considerable performance enhancements in trained endurance athletes any more. Scientific literature with regard to the design of training programs in swimming is rare. Costill et al. [2] analyzed the effect of a more than doubled training amount (4266 to 8970 m per day) with constant intensity for ten consecutive days. Maximal and submaximal blood lactate concentrations and heart rates were decreased after the high-volume training period, whereas maximal 22.9-m performance was unchanged. In 1991, Costill et al. [3] arrived at similar results when comparing two

groups who trained with quite different volumes (5000 vs. 9300 m per day for 6 weeks) and concluded that a considerable increase in training amount does not lead to further performance enhancements, particularly over short distances. However, these authors evaluated independent samples and training intensity was not varied

Table 2 Distribution of total training amount in different intensity zones and example training sets

	HIT		HVT	
	km	% of total	km	% of total
Example training sets				
Total amount	81.2 (7.4)	100	167.8 (23.7)	100
Compensation	17.8 (1.6)	22.1 (2.2)	22.0 (2.6)	13.2 (1.5)
Low-intensity endurance	20 x 100 m at 97% IAT, rest 10 s	38.3 (7.0)	47.2 (6.5)	106.5 (15.5)
High-intensity endurance	5 x 400 m at 101% IAT, rest 90 s	8.4 (4.4)	10.3 (5.0)	27.6 (7.6)
Intensive intervals	10 x 100 m at 108% IAT, rest 40 s 5 x 200 m at 105% IAT, rest 60 s	7.1 (2.6)	8.8 (3.1)	5.7 (2.4)
Speed endurance	training sets near competition velocities and distances	7.5 (2.2)	9.3 (2.8)	4.6 (1.7)
Speed	15-25-m repeated (supra)maximal sprinting	2.0 (0.6)	2.4 (0.8)	1.5 (0.6)

Data as mean (standard deviation); IAT: individual anaerobic threshold

Table 5 Total score as well as the subscores vigor, fatigue, depression, and anger of the "profile of mood states" during both training cycles

	HIT				HVT			
	T1	T2	T3	T4	T1	T2	T3	T4
total	104.7 (20.5)	102.8 (15.2)	108.8 (24.4)	103.8 (26.9)	113.7 (19.8)	113.9 (19.9)	110.9 (23.6)	106.4 (18.8)
vigor	25.0 (5.3)	23.3 (6.3)	20.7 (7.1)	20.8 (5.8)	19.6 (6.9)	20.2 (8.7)	18.2 (8.7)	17.1 (9.2)
fatigue	15.1 (7.6)	13.9 (6.0)	13.7 (6.3)	11.5 (5.3)	14.7 (5.7)	17.7 (7.5)	15.4 (7.5)	12.8 (7.4)
depression	9.0 (9.1)	7.2 (6.2)	8.9 (10.1)	7.8 (12.5)	11.8 (9.2)	9.7 (8.8)	8.4 (9.4)	6.7 (6.6)
anger	5.6 (4.2)	5.0 (4.0)	6.9 (6.5)	5.3 (7.2)	6.8 (7.3)	6.7 (4.7)	5.3 (6.2)	4.0 (3.6)

Data as mean (standard deviation)

Taper What Happens?

Taper. It's a sacred word for athletes across many sports. It signifies the approach of a big competition, a time to show off the hours of hard work you and your team have logged in preparation, and it's a time when your mind and body start to feel refreshed after grinding through workouts for months on end.

But what is taper? It's a word that has taken on a mystical quality in the swimming community within the past decade, as if it's heresy for someone to swim fast at a meet when they aren't tapered. Many have tried, but the art of the taper still hasn't been mastered by any individual or coach, which is why it's such an interesting topic to discuss. One technique that works great for your teammate might make you feel like a rock in the water at your big meet, so it's important for individuals to experiment and work towards the best solution for their own body and mind.

The effects of tapering can be divided into two categories: physical and mental. In this in-depth look at how to approach your taper physically, we'll break down how tapering changes your body, when it should start, and what methods you can use.

Physical Effects

The verb "to taper" is defined as the act of becoming smaller or thinner toward one end. For athletes, that "end" is the championship competition. During taper, an athlete will decrease their training volume and intensity in order to reduce the accumulated effects of fatigue caused by an extended period of hard training. The physiological changes in athletes that have occurred during research studies include increases in VO2 max, increases in anaerobic threshold, and increases in muscular power in the water.

However, the taper isn't a simple checklist to complete during practice. It requires an athlete's attention and focus around the clock leading up to a big competition. This includes ensuring you are getting the proper amount of rest, adequate nutrition, dynamic stretching, warm-ups and race visualization in the weeks prior to racing.

Regardless of the sport or endurance demands, a fact everyone should unanimously agree on is that tapering should be a time for increased specialization for an athlete. Not every taper should be the same, because each athlete has different strengths, weaknesses, and goals. For example, I need at least 1,500 yards of warm-up before my body is properly prepared to do race-pace sets, whereas I have teammates who are more sprint-oriented who will do between 800-1,000 yards before they are ready to swim at race pace. The onus is on the athlete and his or her coach to experiment and figure out the system that works best for them.

When To Start?

The first question of controversy is how far out from a competition should athletes begin their taper and how that timeline should change based on the endurance level of an athlete's competition schedule. Past research suggests it is more important for endurance athletes to maintain high intensity in their training to retain gains in VO2 max following a period of hard training. Sprinters generally have greater muscle mass and spend a larger proportion of their time on dry-land training and thus need more time for their muscles to completely recover following their final intense workouts. Endurance athletes have the difficult task of maintaining their aerobic fitness levels while still allowing their bodies to recover.

There is also a trend around the country that as athletes get older, they need more time to physically taper. From talking to age group coaches across a range of LSCs (Local Swimming Committees), they will typically have their athletes begin their taper 1-1 1/2 weeks out from their big meet, whereas most college and professional groups I have talked to start dropping their yardage 2-3 weeks out from their big meet. I believe this is due to the decreased muscle mass of age group swimmers, higher intensity training blocks in college and professional groups, and age group swimmers having faster physical recovery times due to their bodies still developing.

Taper Methods

Linear Taper

The most common form of taper is called a linear taper, in which yardage is gradually reduced by 10 percent per practice leading up to a competition. This means if a typical tough practice for a group is 8,000 yards, the first day of taper will be roughly 7,200 yards, the second will be roughly 6,480 yards, etc. Research suggest a total decrease of 60-80 percent of volume from a normal practice is the most effective linear taper. By the last couple of days of taper, most college and pro programs are just splashing around in the water for a few minutes and doing a couple of dive starts or pace 50s. The best athletes will be relaxed and enjoying themselves in the warm-up but will switch to a laser focus for those couple of minutes of dive starts or pace work.

Step Taper

The other less common form of taper is called a step taper, which is more popular with endurance athletes. A step taper has a steep drop off of yardage beginning about 4-5 days out from a competition. Athlete will continue with their normal training schedules with lots of race-pace efforts until 4-5 days out and then immediately cut off over 50 percent of their normal volume and intensity. The goal for this type of taper is to allow an athlete to maintain aerobic fitness levels for a race while still giving the muscles and mind a few days of recovery before a competition. Distance athletes, more so than sprinters, are known for being able to swim best times at meets with little physical rest, as we've seen with Katie Ledecky countless times over the years.

Why It's Necessary

This whole taper stuff is great, but how much does a proper taper help an athlete? A systemic review and meta-analysis from a selection of 27 studies in competitive athletes found that the average improvement in performance was roughly 2 percent. That's the difference in going a 19.6 in a 50-yard freestyle instead of a 20.0, which if you're a sprinter, you know that that is a big deal. This study confirms

that a correct taper is essential for an athlete to perform at his or her highest level.

It's important to keep in mind that there is no singular solution for tapering but rather a constantly evolving process that will continue to improve with a better understanding of your own body. Stay tuned for the second part of the series which will delve into the mental side of tapering.

TRAINING FLATLINE?

There are about a thousand different reasons that things have flat-lined for you in the pool.

But there are a handful that I see pop up over and over again both with other swimmers and in my own travels around the black line.

Here are some of the more common reasons your hard work doesn't appear to be paying off:

THE ILLUSION OF THE CLOCK.

The way we judge our swimming, both in practice and in competition, is usually based completely on the scoreboard and pace clock.

Best time? Great success.

Slower than our PB? *Boooooo.*

Using the clock as the only marker for whether a swim was good or not is a problem because the clock isn't the only marker of improvement in the water.

Not even close.

The time on the clock doesn't lie, but it doesn't tell the whole truth. If we base how we feel about our swimming completely and totally on what we see on the clock, then we are ignoring the millions of other things that are happening in the water.

Improvement in the water isn't always reflected by the clock.

When you think about it, becoming a faster swimmer is a transformation—your body is literally adapting and learning to move through the water with less effort.

Not all of the changes you want to happen are going to happen at exactly the same time, and they don't happen at the same rate.

Read that again, because it's important to understand. Change and improvement doesn't happen uniformly.

That being said, even though the clock might not be telling us what we wanna hear that day in the water, what are you doing to improve today?

Are your turns improving? Is your breakout getting better? Are you getting better at holding the breathing patterns? Are you being mindful of your stroke rate on every lap? Are you crushing the high elbow pull? Not rolling your head too much to breathe?

See where I am going with this?

The clock is just *one* measure of getting better in the water.

Being “faster” means doing countless things better. Just because your overall rate of improvement isn’t there today doesn’t mean you can’t hammer away at those other little aspects of your training.

The most powerful side-effect of this mindset change is realizing that there are always things you can control and focus on during workouts when you feel like your hands are slopping through Jello.

We can’t always control how we feel in the water, or what the results are, but we can choose to work on something today that has nothing to do with either of those things.

And of course, the fact that there are so many things you can be working on means that there are countless ways for you to take control of your swimming (and consequently, feel motivated again).

THE FASTER YOU GET, THE SLOWER YOU IMPROVE.

This is one of the less-talked about aspects of high-performance swimming—when we first commit to getting better we improve quickly. Everything is gravy during this phase.

But as we master it (whether it’s a skill, a conditioning level, or a higher elbow catch), and those first few waves of adaptation pass us by, improvement starts to slow down. It might even completely stall out.

Even though we are still working super hard and doing everything right.

It’s just the nature of improvement.

The top swimmers in the world know this better than most. Think about all of the training and practices they do just in the hopes of matching or *slightly* improving their best times.

When we first start something the rate of improvement is hilarious—just don’t expect it to last forever.

Which transitions well into...

YOU ARE WORKING HARD AT DOING THE THINGS YOU ARE COMFORTABLE DOING.

Progress comes from doing new things.

By “new” I don’t mean suddenly switching coach and club mid-week—but by doing a new interval, a lower stroke count, or more dolphin kicks off the wall.

“Working hard” is a really subjective thing to say and just about every swimmer in the water can find a way to justify saying it.

For example, I can say that I went and swam 2,000m *really hard*, but that certainly doesn’t mean I swam *well* or even in a way that is going help me become a better swimmer.

If you are working hard at doing the same things you’ve always done you are just gonna get really good at swimming the same speeds you always have.

Effort isn’t enough.

Your effort needs to be focused at swimming better in all respects, and not just “hard.”

Those times where you experience violent bursts of improvement come from when you are swimming harder *and* better.

ACCUMULATED FATIGUE.

One of the biggest crises in confidence I experienced in my competitive days was around a month out from big meets.

This was usually when training was at its hardest.

The volume was high, the intensity was cranked, and I would find myself frustrated with a lack of speed in the water.

Because I was showing up and working hard every day at practice I was carrying around some serious work fatigue that had built up over the weeks and months of training.

Contrast this with other swimmers in the group who had missed a fair chunk of training. To my chagrin and frustration, they’d crush me in practice because they were essentially tapered.

It felt hilariously unfair to be getting dusted by swimmers who were barely showing up to practices.

The harder you train, the more fatigue you are going to carry around with you.

The effects of yesterday’s hard workout don’t just disappear after a night of sleep. Now imagine the stockpile of fatigue that comes from weeks and months of hard training.

This is the burden of being the swimmer who shows up and kicks butt every day.

The good news?

Have faith in the program and when you get your chance to fully rest up and recover you'll discover a new gear in the pool you never thought possible.

YOU AREN'T GIVING YOURSELF A CHANCE TO RECOVER.

Speaking of fatigue, how hard do you work at the recovery aspect of your training? How serious are you about getting to bed early each night? How well are you eating before, during and after your swim practices?

Along the same vein as accumulated fatigue, if you aren't giving yourself a chance to recover properly between thrashings in the water you aren't giving yourself space to adapt to the training.

Think of your body as a big old battery. If you don't let it charge overnight, how much battery are you left with in the morning? If you aren't giving it sporadic charges over the course of the day how much charge does it have left by the end of the day?

With 25% juice left you are scrambling for ways to get a quick charge over the course of the day (coffee, pre-workouts, etc).

Working hard is awesome, but you should be recovering just as hard.

Think of all those recovery activities as ways to recharge your personal battery.

Stretching and foam rolling after practice. Staying hydrated over the course of the day. Doing some form of mindfulness work to help keep stress at bay. Getting all the sleep you can get your hands on.

Recover as hard as you are working in the pool.

THE HARDEST PART OF ALL... KEEP SHOWING UP.

I'll never forget the first time I swam a :27 long course for a 50 free in practice.

I'll never forget it because *I didn't expect it.*

It came on a Saturday afternoon after a bruising week of training. It was my tenth session of the week, and it was around the 51,550'th meter that I'd swum during that span. At the tail end of a race pace set I dropped a :27 high.

Immediately buoyed by this and wanting to make sure this wasn't a one-off or a fluke, I was able to repeat this result on the next rep.

Ka-boom. Massive breakthrough.

I certainly hadn't planned on it that morning. But I'd shown up, done everything right in training, and gave myself the best possible chance that day for improvement to burst through.

That's what you can do each day. Show up, give your best, and good things will happen.

Those breakthroughs won't happen every day, and you can rarely predict the exact moment they will happen, but you exponentially increase the likelihood of those huge new jolts of improvement by showing up.

That breakthrough you want might not happen today.

Maybe not tomorrow.

But it's coming in hot as long as you keep showing up.

LAST POINTS

1. **Read through this and the first classroom handout again!**
 2. **Proactively plan your season, create practice scenarios for yourself at your next meets. This way you practice your approach for the "Big Meet"**
 3. **Look through the PEAQ Instagram #Mental Health Mondays and put it into your "Classroom Session" Learning**
- Some that work well with this classroom:**
- a. **Smile**
 - b. **Nutrition**
 - c. **Healthy Comparisons**
 - d. **Breath**