

Tempo & TUT – A Primer

Reading Time: 6 minutes

Zen masters have a saying that it is not only what you do that matters, but how you do it. This is very true when it comes to strength training. How you do each rep will affect the outcome of your set, which will in turn affect the outcome of the session, which, ultimately, affects your results in the short and long term. That is why tempo is such a crucial loading parameter.

It is however, the most misunderstood and the least used of all loading parameters, probably worldwide. Go into a gym, and you'll see people pumping iron hard and fast. Emphasis on the fast. While putting your heart into lifting is always great, making sure you get the most out of each rep will ensure short and long term results. And having the correct rhythm for those reps will dictate your results.

This is what tempo is: it dictates the speed of each phase of the lifting. From beginning to end. How fast you go when you lower the weight, how fast you go when you lift it up and how long you pause in-between those two phases.

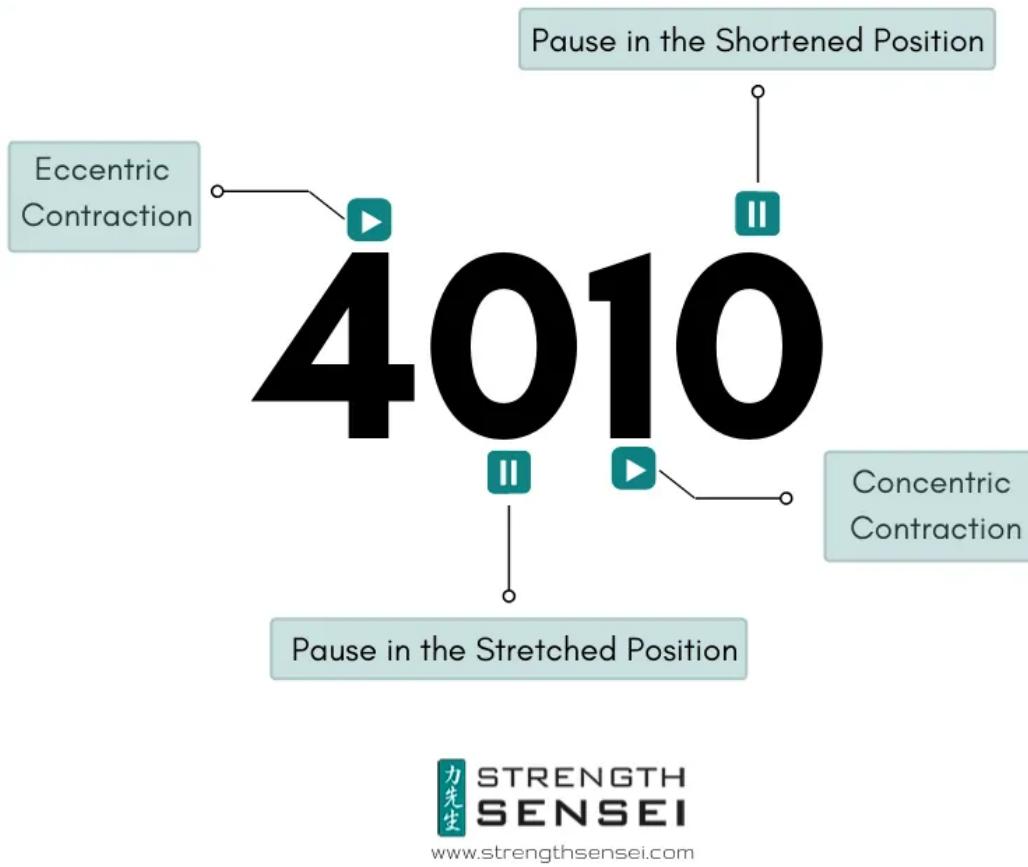
What Is Tempo?

Current tempo prescription is a 4-digit code. It was first invented by Australian coach Ian King, who used a 3-digit formula. He popularized it in the '90, where then rising strength coaching rising star Charles R. Poliquin started using it as well. He added the 4th digit to better reflect a forth possible pause.

So tempo really is a measure of the speed of contraction. Up to this point, the field of strength training science used degrees per second at joint angles to measure speed. Not very practical in most situation and certainly no help to your average gym rat! So tempo because it measures the rhythm of every rep, and the speed of each phase of the contraction.

How is it built? Let's take a look

The Basic Building Blocks Of Tempo



The First Number – Eccentric Contraction

The first number represents the eccentric phase of the contraction. Eccentric refers to a muscle that lengthens under load. Think of a squat, where you have to start the movement by going down. Your muscles lengthen under the load of the bar and your body. This is the most poorly understood phase of the contraction. This is sad, because it is the one where most of the muscle damage that leads to hypertrophy and strength gains are made. Sports scientists such as Tom McLaughlin have also shown that the most successful powerlifters are the ones who have the best control of the load during the eccentric phase. So don't rush it

The Second Number – The Pause in The Stretched Position

This pause occurs while the muscles are lengthened; so in-between the eccentric and concentric phases of the lift. Think of the moment when the barbell touches the chest during the bench press, for example. It is sometimes possible to increase it to provide more challenge during certain lifts, as this is dubbed the “disadvantageous” position. Its purpose is to increase time under tension while the intramuscular tension is maintained.

The Third Number – The Concentric Contraction

The concentric action is what most people think of when they lift. They push the bar up from the chest during the bench press, come back up during the **squat**. It refers to the action of shortening the muscle under load. Sometimes, an X is used instead of a number. This refers to a load you must lift explosively. The best example of this is during Olympic Weightlifting, where the goal is to move the bar as fast as possible, accelerating it to complete the lift.

The Fourth Number – The Pause in The Shortened Position

This is the second pause of the lift. This one is taken during the shortened position, such as when you stand up from a **deadlift**. The 3-digit formula ignored this pause, yet it can provide a small and welcome rest for the fast-twitch fibers during the repetition in most lift. An exception is, of course, the chin-up. To overcome this, coach Poliquin developed the 4-digit tempo formula

A Practical Example

Let's take the 3110 tempo for the bench press to illustrate the concept.

You would start the movement by lowering the bar in 3 seconds

Do a 1 second pause at the bottom

Lift the bar back up in 1 second

And immediately start over, having no pause there (shown by the 0)

By the same token, at 4012 squat would go like this:

Start the movement by going down in 4 seconds

Immediately come back up

Lift the bar in 1 second

Take a 2 second pause at the top, resting your fast-twitch muscle fibers. By the way, these fibers? They are the fibers that have the most potential for both strength and hypertrophy, so a short pause can lead to a big pay off.

Not all movements start with the eccentric contraction though. Think of chin-ups, rows and curls, for example. This does not change the notation of the tempo. You simply follow the third number during the concentric phase and start from there.

So a 3011 dumbbell biceps curl would look like this

Lift the dumbbells up in 1 second

Pause for 1 second at the top

Lower the dumbbells down in 3 second

Start over immediately

Why Pausing at All?

Why put a pause in different place and omit it at other? This is because of the mechanical advantage some lifts have. They are called the advantageous and disadvantageous positions. Trainees rarely ever failed a squat while standing up. Barring those awful fail videos on Youtube that is.

This is because the shortened position is mechanically advantageous in the squat, as most other extensor chain movements. But being trapped under the bar during while bench pressing? Everyone who lifts seriously knows the feeling. This is the disadvantageous position, where there is a poor leverage condition.

Taking a pause in the disadvantageous position can be a good thing, for many reasons

- ✓ It can increase fast-twitch fiber recruitment
- ✓ A pause there teaches the body to overcome inertia
- ✓ It increases time under tension

All of those factors will lead to an increase in strength and muscle mass

Taking a rest in the advantageous position can also be great. It will provide a short rest for those same all muscle fibers, but especially for the fast-twitch fibers, allowing you to squeeze one or two more reps during a heavy set. This is because the fast-twitch muscle fibers are the most sensitive to fatigue. While the rest can also allow you to crank out more reps on lighter sets, remember that the fast-twitch fibers are the ones most easily fatigued

It's All About That Time Under Tension (TUT)

Just as reps are the base units of a set, tempo is the base unit of time under tension. It represents the total time the muscles under load. Science has shown that this time spent in contraction is what will dictate the real effect of your set.

The total time under tension of a set can be calculated by adding the tempo and multiplying by the number of reps. So a 4010 deadlift done for 5 reps will have a TUT of 25 seconds, for example

There is no need to tell you that a set of a deadlifts done with 250 lbs. at a 2010 tempo is quite different than one done with the same load on a 4012 tempo at the same number of reps. The total time under tension is doubled.

Let's say the set was comprised of 6 reps. In the first example, the whole set lasts 18 seconds, while in the second, it lasts 42 seconds. Quite a bit of difference if you are under the bar.

But does time under tension work in real life? While there is quite a body of research going either way, a lot needs to be done to clarify what exactly is being studied and what is measured.

According to Strength & Conditioning Research Chris Beardsley:

“ “Research has reported a dose-response relationship between **training volume and hypertrophy**, but no such relationship between **lifting (concentric phase) tempo and muscle growth**, despite tempo being a very effective way for increasing the duration of time spent performing a set of a strength training exercise.”

“ “In my view, this confusion arises because we have traditionally not defined which muscle fibers are being subjected to tension, nor have we defined the level of tension that must be experienced. Indeed, when all muscle fibers are activated, and the tension is high, **time under tension can be linked to the hypertrophy that results from training.**”

What does this mean? That the fibers most likely to benefit from a high time under tension with a heavy weight are the aforementioned fast-twitch muscle fibers, since they react to high loads. So longer tempos will be most useful for sets of 1 to 8 reps, which encompass the relative strength and functional hypertrophy zones, as you will increase TUT during those heavy sets. One of the best example of this is Olympic Silver medalist Dmitry Klokov, squatting 250 kg (that is 550 lbs) for a single at a tempo of 7610

Dmitry Klokov 250kg paused squat - Training For Strength Sports Perth



However, some studies have also shown that both strength and mass do benefit of being trained at different TUT, providing a different training stimulus that keeps things interesting in the gym and the nervous and muscular systems from adapting too quickly to what you throw at them.

To sum it up:

REP TEMPO: THE #1 TRAINING VARIABLE



Master the tempo for faster and greater gains in strength and muscle



First Digit – Eccentric Contraction

This is the portion of the exercise when your muscles lengthen.

For example, when you lower the dumbbells during a biceps curl.

The most successful powerlifters are the ones who have the best control of the load eccentrically.



Second Digit – Pause in the Stretched Position

This pause takes place between the eccentric (lowering) and the concentric (lifting) portion of an exercise.

Pauses in the “disadvantageous” position of a lift provide poor leverage and increase intramuscular tension. This can significantly boost your strength.



Third Digit – Concentric Contraction

The concentric contraction happens when a muscle shortens.

For instance when you curl a dumbbell to your shoulders.

If X is used as the fourth digit, this means the motion is explosive with full acceleration.



Fourth Digit – Pause in the Shortened Position

This contraction occurs at the end of the concentric phase.

For instance during the lock out of the bench press.

Pauses in this “advantageous” position provide good leverage and help increase the recruitment of fast-twitch fibers.



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Final Words

So there you have it. Tempo is a great standardization tool for your training. It will be best used for high time under tension for short(er) rep sets and will offer an interesting way to keep things new. Try out the Klokov squat challenge, you'll see what we mean.

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