

Training to Failure

This article is dedicated to **people who train in the gym**. It does not matter whether you are a **beginner** or an **experienced athlete**; what matters is that you have some practical experience.

Many of us, at least once in our lives, have made a bet to perform a certain number of **push-ups** or **pull-ups**—maybe not a fixed number, but a challenge like “*Who can do more?*”. I believe most people remember that after such a **competitive set** of pull-ups or push-ups, they felt **completely exhausted** and needed a long time to recover. If someone had challenged you again by saying, “*Come on, do another Herculean effort!*”, you would have certainly answered: “*No, that’s enough.*”

This means that you performed a **set to failure**.

What Is Strength?

From middle school physics we know that **force** is defined as $F = m \times a$, where “**m**” is the mass we move (either an external load or our own body weight) and “**a**” is the acceleration applied to that mass. In other words, **force** is the product of mass and acceleration.

To reason practically about “**m**”, sports scientists have agreed to express it as a **percentage of the maximum load** a person can lift, known as the **one-repetition maximum (1RM)**. The same researchers have established that the most effective load for **health-oriented training** lies between **40–80% of 1RM**. However, the **duration of a set should not exceed 60 seconds**, due to excessive production of acidity.

More precisely, the problem is **not lactate itself**, but the accumulation of **hydrogen ions (H^+)**.

Hydrogen Ions, Acidity, and Rejuvenation

An **optimal amount of H^+ ions** in the body can be beneficial for **rejuvenation processes**, but when acidity rises beyond a certain threshold (**blood lactate above ~10 mmol/L**, associated with excessive H^+ accumulation), it begins to **damage health**.

I describe this mechanism in detail in my essay “**Athletic Preparation in Martial Arts...**”, available on this website in **free PDF format**.

Sports scientists have discovered that a **set performed to failure** is highly effective

at activating **protein synthesis**, and consequently supports **rejuvenation**. Go back to your own memories of performing a set to failure during a challenge. Recall how exhausted you felt. Why? Because your muscles were saturated with **hydrogen ions**, and it took time to **eliminate them**.

Practical Training Guidelines

For **effective rejuvenation**, training should be performed with **40–80% of 1RM**, with **each set lasting no longer than 60 seconds**. Sets should be taken **to failure**. Recovery between sets must be **long enough to reduce acidity**, that is, to allow **H⁺ levels** to decrease.

The required recovery time depends on the exercise:

- For **squats** or other **multi-joint exercises**, rest periods of about **10 minutes** are necessary.
- For **biceps or triceps**, **5–6 minutes** of rest are sufficient.

Long recovery periods should be filled with **very light activity**. For example, after squats, one may perform **gentle pedaling on a stationary bike**, then proceed to the bench press and some **abdominal exercises**.

Muscle Recovery After Training to Failure

How many days are required for muscle recovery after a **devastating training session to failure**?

- For **young individuals**, **10–15 days** may be sufficient.
- For a **60-year-old woman**, recovery may take **3–4 weeks**.

This does **not** mean that the muscle should not be trained during this period. On the contrary, **maintenance training** is highly beneficial. The same squat can be performed **daily**, for **2–3 light sets** with low repetitions. However, a truly **shocking stimulus** for the quadriceps should be applied **only once or twice per month**.

What We See in Gyms Today

What do we observe in most gyms today? People appear to train hard at first glance, resting only **1–2 minutes between sets**, performing **10–20 sets per muscle group**, and repeating this pattern for **years without progress**. When progress stalls, they often see only one solution: using substances **prohibited by WADA**.

I propose a **training system** based on a **deep understanding of biochemistry, physiology, and sports pedagogy**. At the **Moscow University of Physical Education and Sport**, scientists developed a **mathematical model**, tested **thousands of methodologies and protocols**, and validated their outcomes.

Some of these results are presented in my essay “**A Modern Scientific Approach to Rejuvenation**”, available on this website and **free to read and download**.

Conclusion

My system is **science-based** and capable of improving **physical performance and health** in people of **any age and training level**, without the use of any drugs.