A TRAINING REFERENCE

Hypertrophy Training

Principles That Work

A structured reference on volume, frequency, progressive overload, exercise selection, program design, recovery and nutrition for muscle growth.

2026 REFERENCE EDITION
Compiled for professional coaching and personal training use

VLADIMIR BRUSOV
Strength & Conditioning Coach

ABOUT THIS DOCUMENT

This document collects the training and nutrition principles that survive contact with practice. It is written for coaches and for experienced trainees who want the reasoning behind a recommendation rather than the recommendation alone. Where the evidence is strong, it says so. Where a popular model is a useful approximation rather than an established fact, it says that too.

The material is organised from the general to the specific. Part I establishes the framework and the minimum viable program. Part II treats the mechanics of the training stimulus: how much, how often, how hard, and how to keep adding. Part III concerns the construction of a program. Part IV covers recovery and energy management, which determine how much of the stimulus is converted into tissue. Part V takes the long view: how the rules change with training age, and the psychological factors that decide whether any of it gets done.

Three conventions are worth noting. Set counts refer to hard working sets only; warm-up sets are never counted. Effort is expressed in reps in reserve (RIR) throughout. Loads and body weights are given in kilograms with pound equivalents alongside.

The reader assumed throughout is a trainee whose goal is muscle growth. Most of the material applies unchanged to physique competitors, and the few passages written specifically for them, such as peak week and the section on getting exceptionally lean, are marked where they appear. Nothing here addresses peaking for strength sport, which is a different problem with a different literature.

A NOTE ON CERTAINTY

Training science is a field of moderate effect sizes measured in short trials on small samples. Almost nothing here is settled to the standard of physics. The recommendations that follow are those that have held up across independent lines of evidence and across decades of coaching practice, which is a lower bar than proof and a higher one than opinion. Sections that rest on a model rather than on direct evidence are marked as such in the text.

CONTENTS

PART I · FOUNDATIONS

1 Training Philosophy 5

2 The Beginner Program 6

3 Training Principles 8

PART II · THE TRAINING STIMULUS

4 Volume 10

5 Effective Reps 12

6 Frequency 16

7 Progressive Overload 18

8 Intensity and Effort 20

PART III · BUILDING THE PROGRAM

9 Exercise Selection 23

10 Program Design 25

11 Special Techniques 27

PART IV · RECOVERY AND ENERGY

12 Recovery 29

13 Nutrition 30

PART V · THE LONG VIEW

14 Training Age and Periodisation 39

15 Mindset and Application 40

16 Quick Reference 41

17 Glossary and Further Reading 43

PART ONE

Foundations

The framework behind every recommendation that follows, the minimum viable program, and the laws that govern how muscle grows.

IN THIS PART

1 Training Philosophy
2 The Beginner Program
3 Training Principles

SECTION 1

Training Philosophy

Where most training goes wrong, and the single idea that fixes it

> *Training works when you keep it simple and stay consistent.*

Most people who are not getting results are not missing a secret technique. They are failing to execute the basics well enough, for long enough. This is an unglamorous diagnosis, and it is correct far more often than the alternatives.

Progressive overload is the mechanism that drives growth. Everything else (exercise selection, rep ranges, split structure, advanced intensity methods) exists to support that one goal. When a programming decision is genuinely difficult, the question that resolves it is usually this: which option lets this trainee keep adding load, session after session, for the next six months?

Pick a solid program. Add weight over time. Recover properly. Do not switch things every few weeks. The rest of this document is commentary on those four sentences.

THE FAILURE MODE TO WATCH FOR

Novelty feels like progress. Changing the program produces immediate sensations (novel soreness, a new pump, renewed motivation) that are easily mistaken for adaptation. Adaptation is slower and quieter than that, and it is visible only in the training log. A trainee who cannot show you a rising load or rep count across eight weeks has not been training, whatever else they have been doing.

SECTION 2

The Beginner Program

Everything a new trainee actually needs, and nothing else

> *Train 4 to 8 hard sets per muscle in the 6–12 rep range, once every 3 to 5 days, and progress the load over time. That covers 90 per cent of what matters.*

Everything else in this document builds on that sentence. It should be mastered before anything else is attempted. The program below is one concrete implementation of it.

A first program: full body, three days per week

- One to two exercises per muscle group.
- Two to three working sets per exercise.
- Eight to twelve reps per set.
- One to two minutes of rest between sets.
- When all sets are completed at the top of the rep range, add weight the following session.
- Prioritise consistency over creativity.

How to progress

This is the only progression rule a beginner needs, and it will carry them for a year or more.

01 **Pick a rep range.** Start with eight to twelve. Select a weight you can lift for eight reps but not thirteen.

02 **Do your sets.** Three sets. Stop each one when another rep with good form is no longer available.

03 **Record the numbers.** Write down the weight and reps every session. This is not optional; without it there is no way to know whether progression is occurring.

04 **Add weight when ready.** On reaching three sets of twelve with good form, add 2.5 kg (5 lb) on upper-body lifts or 5 kg (10 lb) on lower-body lifts the next session.

05 **Repeat for months.** This alone builds a significant amount of muscle. Do not change programs for at least three months.

The eight most common beginner mistakes

01 · SWITCHING PROGRAMS TOO OFTEN

Adaptation takes weeks. Changing before it has occurred produces nothing at all. One program, three months minimum.

02 · NEVER ADDING WEIGHT

Lifting the same load indefinitely is maintenance training from day one. Growth requires an increasing demand.

03 · CHASING SORENESS

Soreness is not growth. It is possible to become extremely sore from movements that produce no adaptation whatsoever.

04 · TOO MUCH VOLUME TOO SOON

Starting at twenty sets per muscle per week is a common error. Five to eight sets produce better results at lower injury risk.

05 · NOT TRAINING HARD ENOUGH

On light and moderate loads, stopping five or more reps short of failure provides very little growth stimulus. Sets have to be genuinely challenging.

06 · DROPPING THE WEIGHT

A controlled descent keeps tension on the muscle and protects the joint at the bottom. The exact count matters far less than not letting it fall.

07 · SKIPPING WARM-UPS

Going straight to heavy working sets raises injury risk and lowers performance on the sets that count.

08 · POOR EXERCISE CHOICES

If the target muscle cannot be felt working, it is probably not being trained. Choose movements in which it is the weakest link.

Exercise selection for beginners

The movements below are chosen for one property: they make the target muscle the limiting factor without requiring years of technical development. A beginner does not need to feel their quadriceps in a squat to train them, but a machine that guarantees the stimulus removes the question entirely.

The last two rows are a deliberate exception. Section 9 explains why the barbell squat and the overhead press suit some builds and not others, and a beginner cannot yet know which they are. Both are included because the movement patterns are worth owning and are far easier to learn at light loads than at heavy ones. If either lift consistently fatigues the lower back or the triceps before the target muscle, drop it and use the machine alternatives instead.

Table 1. Default exercise selections for the first training year.

TARGET	DEFAULT CHOICE	WHY IT WORKS FOR A BEGINNER
Quadriceps	Leg extension	Guarantees quadriceps stimulus regardless of limb proportions.
Back	Machine or cable row	Removes the lower back as the limiting factor; the back musculature is trained directly.
Chest	Pec deck, cable fly, machine press or push-up	Any of these lets a beginner load the chest without fighting a barbell. Fly and pec deck take the triceps out of the equation; the machine press and the push-up are simple to learn and easy to repeat.
Shoulders	Dumbbell lateral raise	Full range of motion is the priority; the arm should travel all the way down to the hip.
Biceps	Machine or preacher curl	Fixes the upper arm so the shoulder cannot assist, and allows a full stretch at the bottom.
Triceps	Rope pushdown	Simple, easy to feel, and easy to take to full extension.
Legs, compound	Leg press	Builds quadriceps, glute and hamstring mass with far lower technical demand than a squat.
Lower body, barbell	Back squat	The most effective single lower-body compound; worth learning early because the pattern pays off for decades.
Shoulders, compound	Overhead press	Builds shoulder strength and stability that transfers to every upper-body lift. Begin with dumbbells if mobility limits the barbell.

SECTION 3

Training Principles

The foundational laws that govern how muscle grows

Six principles account for most of what separates productive training from mere activity. They are stated here without qualification.

TRAIN FOR THE GOAL

Training has to match what it is meant to achieve. If the goal is muscle growth, the program must be designed for muscle growth, not merely for working hard in general. Specificity is the first decision, not a detail.

THE BODY ADAPTS TO WHAT IT IS GIVEN

The body changes only when pushed beyond what it is already accustomed to. Identical weights, reps and exercises give it no reason to change.

TENSION DRIVES GROWTH

Muscles grow when they are loaded and challenged. This is why control on the descent matters: a weight dropped rather than lowered discards half the set.

TRAIN, RECOVER, REPEAT

You train, the body recovers, and it returns slightly stronger. That cycle, repeated consistently, is what builds muscle. Too much training breaks the cycle; too little stimulus and nothing changes.

SORENESS IS NOT GROWTH

Delayed-onset muscle soreness is a separate process from the signalling that drives muscle protein synthesis. Severe soreness can follow activities that cause no growth, and substantial growth can occur with none. It is a poor feedback signal.

STRENGTH AND SIZE ARE RELATED, NOT IDENTICAL

Bigger muscles are generally stronger, and getting stronger generally builds bigger muscles, but not one for one. Strength can rise through neural efficiency without much hypertrophy, and size can rise without proportional strength gains.

THE VARIABLES UNDER YOUR CONTROL, AND THE ONE THAT IS NOT

- **Frequency.** How often a muscle group is trained.
- **Intensity.** How hard it is trained: load, effort, and proximity to failure.
- **Volume.** Total work performed: sets, reps and load combined.
- **And a fourth you do not control.** Recovery capacity constrains all three, and Part II treats each in turn against that constraint.

PART TWO

The Training Stimulus

How much, how often, how hard, and how to keep adding: the quantitative core of program design.

IN THIS PART

4 Volume
5 Effective Reps
6 Frequency
7 Progressive Overload
8 Intensity and Effort

SECTION 4

Volume

How many sets to do, and what too little and too much look like

5	10–16	10	2×
Minimum working sets per muscle per week to stimulate growth	Productive working sets per muscle per week for most athletes	Maximum effective working sets per muscle in a single session	Splitting weekly volume across two sessions beats cramming it into one

The floor: the minimum required to grow

Roughly five hard working sets per muscle per week is the threshold below which meaningful adaptation stops. Below it, training maintains at best and detrains at worst. Every program should sit above this line for every muscle group it claims to train, including during a deload.

The productive range: where most growth happens

For most athletes, ten to sixteen hard working sets per muscle per week is where the majority of growth occurs. This range balances stimulus against recovery. Going substantially above it rarely produces proportionate extra results.

The ceiling: where extra sets stop being worth it

Extra sets continue to add growth for a long time. The research does not show muscle shrinking because too much was done; that claim is wrong and worth retiring. What the data show is diminishing returns: each additional set buys less than the one before it, while joint stress, time cost and recovery debt keep climbing at full price.

That is the real ceiling, and it is an economic argument rather than a physiological one. It also sits lower than the studies imply, because eight-to-twelve-week trials on machines never measure the cost side: the sore elbow in month six, the accumulated sleep debt, the week that gets skipped. Finding the point at which the trade stops being worth it is a skill that develops with training experience, and it differs between individuals and between muscle groups in the same individual.

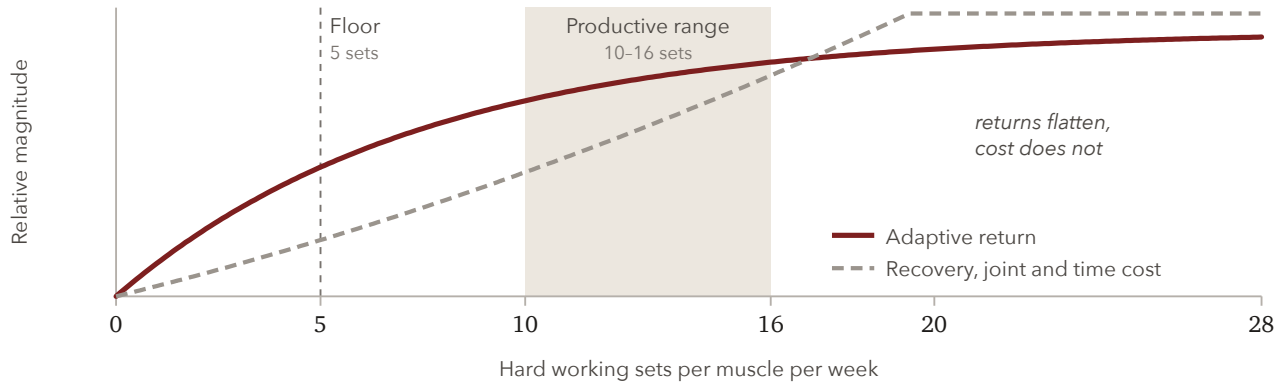

Figure 1. Weekly set volume against adaptive return and accumulated cost. The return curve flattens but does not turn downward; the cost curve does not flatten at all. The practical ceiling is the point at which the two diverge faster than the trainee is willing to pay for.

Set quality over set count

Not all sets are equal, and set count is therefore a crude unit of measurement. Warm-up sets do not count as working sets. Only sets taken close to failure, within roughly three reps, deliver a genuine growth stimulus. Ten quality sets beat twenty sloppy sets every time, and the trainee who understands this can cut their training time substantially without losing anything.

❖

Raw set count is a poor proxy for training quality. The next section supplies a better one.

SECTION 5

Effective Reps

Why not all reps are equal, and what actually drives growth

A set of five, a set of fifteen and a set of twenty-five can produce the same hypertrophy outcome, provided all three are taken to genuine failure. The rep range does not determine the stimulus. What determines it is how many reps occurred while every available motor unit was actually engaged. Those are effective reps.

~5	80–85%	Last ~5	20–40
Effective reps yielded by a max set of 5, 15 or 25: all roughly equal at failure	Load threshold above which high-threshold fibres are recruited from rep one	Reps of a set in which full recruitment and the growth signal are concentrated	Effective reps per muscle per session as a practical working range

Why muscles only respond to what gets recruited

The nervous system recruits muscle fibres in a fixed order, from the smallest and most fatigue-resistant (Type I) up to the largest and most powerful (Type II), in proportion to the force required. Type I fibres have limited growth potential. Type II fibres carry the bulk of the hypertrophy capacity.

A fibre that is never recruited receives no mechanical signal and produces no adaptation. Recruitment is the prerequisite for growth, not the result of it.

There are two routes to it. Under heavy load, at or above roughly eighty per cent of maximum, force demand is high enough that the whole motor unit pool is engaged from the first or second rep. Every rep then counts, failure is unnecessary, and the efficient working range is a set of roughly five to eight reps. Under light load the order reverses: low-threshold fibres go first, higher-threshold fibres arrive only as those fatigue, and full recruitment is reached in the closing reps alone. There, failure or something very near it is not optional.

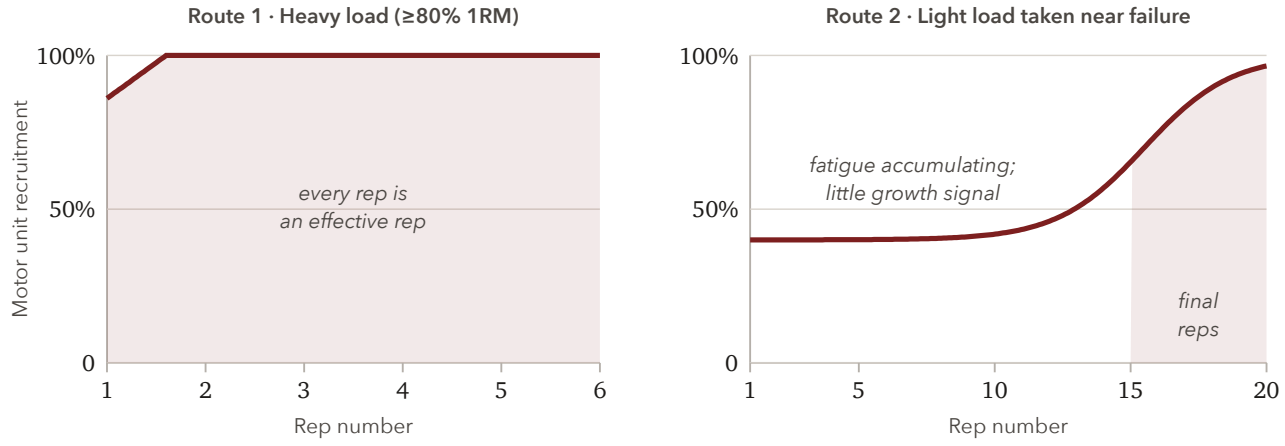

Figure 2. Two routes to full motor unit recruitment. Under heavy load, recruitment is complete from the opening reps and effort can be submaximal. Under light load, recruitment rises only as the low-threshold fibres fatigue, so the set must be taken close to failure for anything useful to happen. Shaded areas mark the effective reps.

What tension actually does

Recruiting a fibre is only half of the job. When a recruited fibre contracts hard, that force pulls on sensor proteins anchored inside the muscle cell, and those sensors convert the mechanical pull into a chemical signal that switches on protein synthesis. That is the whole mechanism, and it is the reason tension is the thing worth chasing rather than soreness, fatigue or the burn.

It also explains why recruitment on its own is insufficient. A single maximal repetition recruits every fibre available and produces almost no growth, because one contraction is not enough work. A fibre must be recruited and then made to perform a meaningful number of hard repetitions.

The burn of a high-repetition set comes from metabolite accumulation, and metabolites do not stimulate growth directly. What they do is force the nervous system to recruit high-threshold fibres earlier than the load alone would demand. The pump is a recruitment tool, not a second growth pathway. Blood flow restriction works the same way: restricting flow accelerates that accumulation, so the largest fibres are engaged at twenty to thirty per cent of maximum. Both are alternative routes to the same effective reps.

The rep range paradox, resolved

Research consistently finds no meaningful hypertrophy difference between rep ranges of five and thirty when both are taken to failure. This looks paradoxical until it is expressed in effective reps, at which point it becomes arithmetic.

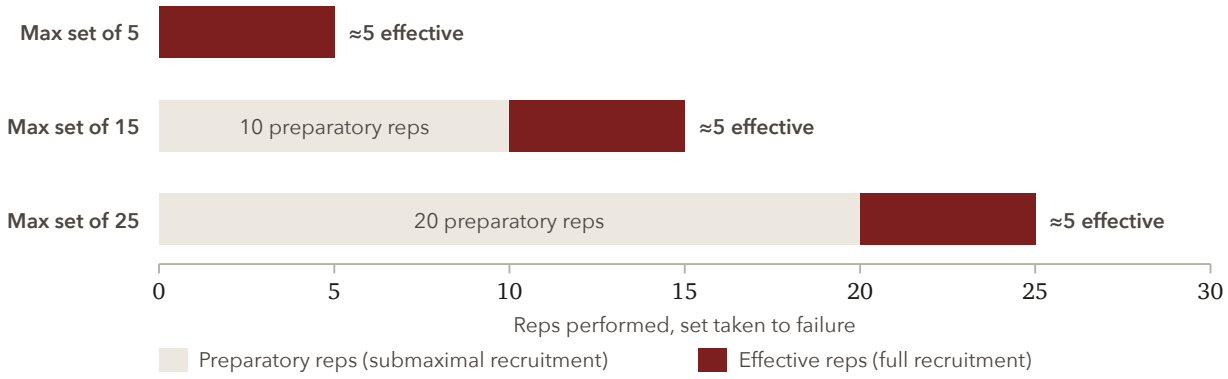

Figure 3. Three sets of different length, all taken to failure, all yielding roughly five effective reps. The sets are equivalent in stimulus and differ only in efficiency: in how many preparatory reps had to be performed to accumulate the same five.

> *A light set stopped eight reps short of failure earns almost nothing, because full recruitment was never reached. The same weight taken to failure earns four or five effective reps. The difference between a wasted set and a productive one is often just a few extra reps.*

Why volume debates dissolve

Programs that appear to use radically different volumes often arrive at the same effective rep total per session by different routes. Once the totals are computed, most published disagreements about volume turn out to be disagreements about bookkeeping.

The four systems below all land near the conservative end of the twenty-to-forty range given above. Advanced trainees and larger muscle groups sit higher in that range; the point of the comparison is the cost column, not the total.

Table 2. Four training systems, and the effective reps each actually delivers.

APPROACH	PER SET	SESSION TOTAL	COST
Straight sets to failure (four to five)	~5 effective reps	~20–25	**Low.** The most direct route, and the least time spent.
Rest-pause and myo-reps	Clusters held under full recruitment	~20–25	**Low.** High effective-rep density from few working sets.
Eight to ten sets at 2–3 RIR	~2–3 effective reps	~20–30	**Moderate.** More sets for the same result, and how most trained lifters actually train.
Thirty sets at 4 RIR	~0–1 effective rep	~20–30	**Very high.** Enormous fatigue for roughly the outcome four quality sets would produce.

Systems that have stood the test of time all land in the same window. Golden-era routines built on many moderate working sets, high-intensity routines built on a single set to failure plus forced reps, and modern rest-pause systems all compute to roughly twenty to thirty effective reps per muscle per session. This is also where the familiar guidance of ten to twenty sets per muscle per week originates: five all-out sets twice weekly is ten working sets, and training at two to three reps in reserve needs about twenty sets to reach the same figure.

Why triples are not better than fives

At very high loads, in the one- to three-rep maximum range, the body increases force output by firing existing motor units at a higher frequency rather than by recruiting additional fibres. A maximal triple and a maximal set of five therefore recruit essentially the same fibres. The triple delivers three effective reps; the set of five delivers five, at lower injury risk and with fewer total sets needed to accumulate meaningful volume.

Junk volume and the saturation point

Beyond some per-session threshold, additional effective reps produce diminishing returns: each adds less signal than the one before. This is the principle behind junk volume, which comes in two forms: sets that never reach full recruitment because effort was insufficient, and sets that arrive after the tissue has already received enough stimulus for the session. Both add fatigue without adding signal.

The practical implication is uncomfortable for high-volume orthodoxy: a lifter performing twenty submaximal sets at 4 RIR is probably accumulating roughly the stimulus of a handful of hard sets, while generating considerably more systemic fatigue.

MODEL LIMITATIONS: THE STRICT VERSION IS AN OVERSTATEMENT

The claim that only fully recruited fibres adapt is technically incorrect. Lower-threshold fibres still receive a stimulus and still grow from submaximal work, simply less so. The more accurate framing is this: to maximally stimulate every available fibre, those fibres must first be recruited and then exposed to sufficient mechanical load. The effective reps model is the best current framework for explaining the data. It is not a proven physiological law, and the twenty-to-forty figure is inferred from programs known to work rather than measured directly. No study has yet counted effective reps against growth. Treat it as a useful unit of accounting and hold it loosely.

Practical summary

- Under heavy loads at or above eighty per cent, every rep is an effective rep; do not waste sets by stopping five or more reps short.
- Under light loads of fifteen reps and above, the set must be taken to or very near failure. Stopping early produces almost no growth signal.
- Metabolic stress and blood flow restriction are recruitment tools, not a separate growth pathway. Tension remains the signal.
- High-volume programs work only when per-set effort is high enough. Volume without effort is junk.
- Four to six quality sets to failure often outperform fifteen to twenty submaximal sets with the same total rep count.
- Counting sets does not tell you how hard someone trained. Counting effective reps does.

SECTION 6

Frequency

How often each muscle group should be trained

> *For most people, training each muscle group twice per week produces meaningfully better results than training it once.*

The adaptive response to a training session rises, peaks and then fades over the following days. Waiting a full week means starting from baseline each time rather than building on the previous session. Twice weekly keeps the tissue in an elevated adaptive state for a far larger proportion of the week, for the same total volume.

Three-times-per-week full-body training has been the practical gold standard across most of training history and remains the best default for beginners. An upper/lower split run four days per week reaches the same frequency with more volume per session, which suits intermediates. Training a muscle once per week does work; it simply works less well.

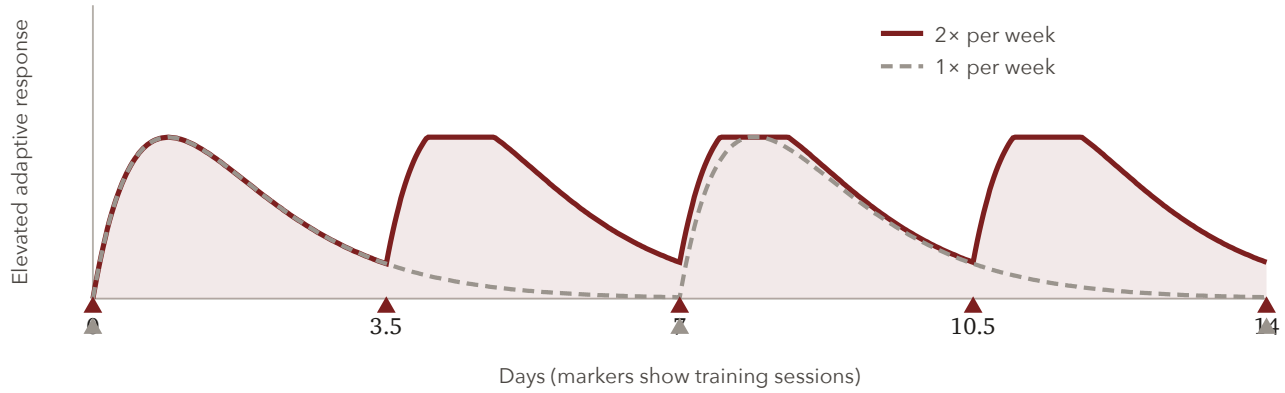

Figure 4. The elevated adaptive response following a training bout, under two frequencies with identical weekly volume. The twice-weekly schedule re-stimulates the tissue before the previous response has decayed; the once-weekly schedule spends much of the week at baseline.

THE CONNECTIVE TISSUE WARNING

Muscle recovers faster than tendon and ligament. Muscle tissue can recover from a stimulus in forty-eight to seventy-two hours. Tendons and ligaments adapt on a timescale of weeks and months, not days. Training the same muscle four to six times per week creates cumulative connective tissue stress that far outpaces structural adaptation, and this is one of the primary mechanisms behind overuse injury in athletes who chase frequency without managing total load. More sessions per week require fewer sets per session. Total weekly volume must remain within recovery capacity regardless of how it is distributed.

Choosing a frequency in practice

Frequency is chosen last, not first. Start from the number of days the trainee will reliably attend, then select the split that reaches each muscle twice within those days.

- Three full-body days is the default for anyone in their first two years.
- Four days on an upper/lower split is the default for intermediates who have the time available.
- Two days per week is workable, but per-session volume has to rise, and the ceiling of roughly ten hard sets per muscle per session becomes the binding constraint.
- Frequencies above three sessions per week for the same muscle are a specialisation tool rather than a default, and require per-session volume to fall in proportion.
- Whatever the structure, weekly volume per muscle is the figure that must land in the productive range. Frequency only determines how it is parcelled out.

SECTION 7

Progressive Overload

The engine of growth, and how to keep it running for years

> *Progressive overload means adding more when the body has adapted, not adding weight on a fixed schedule. If the current weight is still challenging, it is still working.*

The three progression methods

SINGLE PROGRESSION

Fix the rep count at, say, three sets of eight. Complete all sets, and add weight the next session. Very simple, and it works well for beginners. Its limitation is that it becomes unreliable as the weights get heavy and the jumps get relatively larger.

DOUBLE PROGRESSION · RECOMMENDED

Choose a rep range, for example eight to twelve. Start at the bottom with a given weight and add reps each session until the top is reached. On hitting three sets of twelve, add weight and drop back to eight. The best system for most people: one clear rule, self-regulating.

TRIPLE PROGRESSION

Manipulate sets, reps and load together: begin with fewer sets, add sets, then reps, then weight. More complex, and best reserved for advanced athletes or for deliberate specialisation blocks.

WHICH TO CHOOSE

Beginners should run single or double progression and nothing else. Intermediates should default to double progression on every lift. Triple progression is a tool for a specific purpose, not a general default.

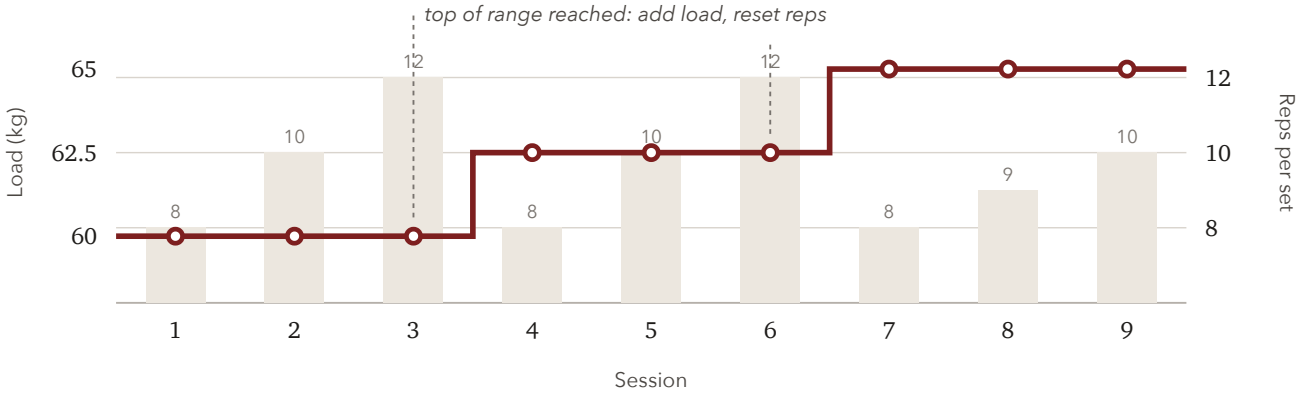

Figure 5. Double progression across nine sessions. Reps climb within the prescribed range at a fixed load; when the top of the range is reached on all sets, load increases and the rep count resets to the bottom of the range. The load history is a staircase, not a ramp.

How much weight to add

- **Upper body:** 2 to 2.5 kg (5 lb) per increment.
- **Lower body:** 5 kg (10 lb) per increment.

- One extra rep at the same weight is worth roughly two to three per cent additional load. That counts as progress.
- As training age increases, increments must get smaller. Microloading plates of 0.5 to 1.25 kg are not an affectation; they are what makes continued linear progress possible on upper-body lifts.

When progress stops

Plateaus are a normal feature of training, not evidence of a defective program. The reflex to change everything at the first stall is responsible for an enormous quantity of wasted training time. The protocol below resolves most plateaus without changing anything at all.

01 **Do not switch programs.** The program is usually not the problem. Changing it destroys the one thing that was working, which is the accumulated adaptation to it.

02 **Continue for three to four more weeks at the same weight.** Stay at the load that stopped progressing. The body continues adapting even when the rep count is not climbing.

03 **Rep out on the last set.** On the final session of the block, take the last set for as many reps as possible.

04 **Decide from the result.** Two or more extra reps means it is time to add weight. Zero or one means another two to four weeks at the same load, then retest.

SECTION 8

Intensity and Effort

How hard to train, and when failure actually matters

Reps in reserve

RIR expresses how many further reps could have been completed at the point the set was stopped. It is the most useful single measure of training effort, more informative than percentage of maximum because it accounts for the day, the fatigue and the individual.

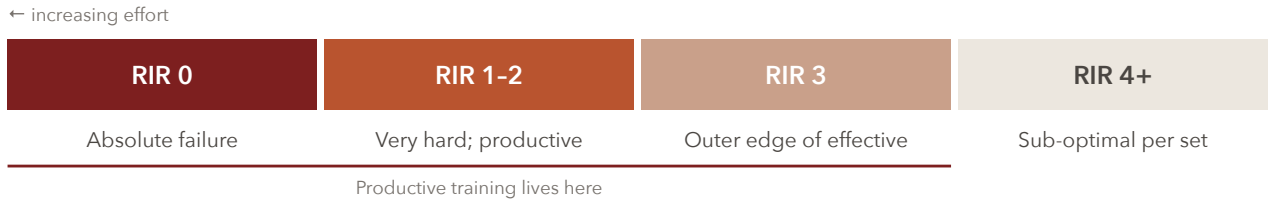

Figure 6. The reps-in-reserve scale. Productive training lives in the left three bands. Sets at 4 RIR and beyond still grow muscle, but far less per set; they pay off only when weekly volume makes up the difference.

> *The last few reps of a set are where the growth happens. Stopping well before you have to leaves most of the work undone.*

The most important rule about failure

HEAVY SETS · EIGHT REPS OR FEWER, AT 80–85% OF 1RM AND ABOVE

Do not need to be taken to failure. All motor units are recruited from the first or second rep, so the stimulus is present throughout the set. Taking heavy squats and deadlifts to failure adds injury risk without adding proportionate stimulus.

LIGHT SETS · FIFTEEN TO THIRTY REPS

Must be taken close to failure. Low-threshold fibres are recruited first, and high-threshold fibres only come in as fatigue accumulates. Stopping early wastes the set entirely; the growth is concentrated at the end.

Tempo and execution

CONCENTRIC PHASE

Intend to move explosively, even when the weight itself moves slowly under load. The attempt to accelerate is what recruits additional motor units; whether the bar actually moves fast is beside the point.

ECCENTRIC PHASE

Controlled, never dropped. Tempo itself is a weak variable: anything from roughly one to four seconds on the descent grows muscle equally well once everything else is matched, and only very slow reps of ten seconds and above are clearly worse, because they force the use of a lighter load. Control the descent for tension and joint safety, not to hit a stopwatch number.

BAR SPEED AS FEEDBACK

If a working weight suddenly moves faster than usual, adaptation has occurred and the load is now too light. Bar speed signals readiness to progress before the rep count does, and an attentive coach uses it as an early indicator.

Table 3. Rep ranges and their primary applications.

CATEGORY	RANGE	BEST FOR
Heavy	1–5 reps	Strength and neural efficiency; still builds muscle given sufficient volume.
Moderate	6–12 reps	The hypertrophy sweet spot; the best balance of stimulus per unit of fatigue.
Light	13+ reps	Metabolic stress and pump; must be taken close to failure to work at all.

These bands describe the length of the set, and they cut across the two recruitment routes of Section 5. Heavy loading in the effective-reps sense begins at roughly eighty per cent of maximum, which for most lifters is a set of five to eight reps, and so straddles the heavy and moderate rows here.

PART THREE

Building the Program

Choosing movements, structuring the week, and the advanced methods that are worth the fatigue they cost.

IN THIS PART

9 Exercise Selection
10 Program Design
11 Special Techniques

SECTION 9

Exercise Selection

Why the best exercises are not best for everyone

> *Hypertrophy is local. The target muscle must be the first thing that reaches its limit. If the lower back fails on deadlifts before the hamstrings do, the deadlift is not training the hamstrings. It is training the lower back.*

The core rule: target muscle equals limiting factor

For any exercise to produce hypertrophy in a target muscle, that muscle must reach its limit before anything else does. If something else gives out first (lower back, triceps, grip, breathing), then that structure is what is being trained. Choose exercises in which the muscle you are trying to develop is the weakest link in the chain.

This rule explains why exercise selection is individual rather than universal. Limb proportions, tendon insertions and torso length determine which structure fails first in a given movement, and no amount of technique work changes a femur.

Range of motion and the lengthened position

Exercise selection decides which muscle is loaded. Range of motion decides how much of that muscle is loaded, and it is the variable most often quietly discarded once the loads get heavy.

Full range of motion outperforms partial range in almost every comparison that has been run, and the advantage is not evenly distributed across the movement. Work done in the lengthened position, where the muscle is stretched under load, appears to carry more of the growth stimulus than work done in the shortened position. This is why a lateral raise taken all the way down to the hip beats one bounced through the top half, and why a preacher curl with a full stretch at the bottom beats a half rep with more weight on it.

Two consequences follow. When load and range of motion compete, range of motion usually wins: the lighter weight through the full movement is the better set. And exercises that load the muscle hardest where it is longest are worth prioritising for that reason alone, among them the incline dumbbell curl, the overhead triceps extension, the Romanian deadlift, the seated leg curl and the bottom of a fly.

The exception is the small number of positions where the lengthened range carries genuine injury risk rather than extra stimulus. A deep loaded stretch at the bottom of a heavy bench press is the clearest example. The leg extension lockout discussed in Section 12 is the same problem at the opposite end of the movement.

The big five: when they work and when they do not

BARBELL SQUAT

Excellent for those whose proportions allow the quadriceps to be the limiting factor. A problem for tall lifters with long femurs, in whom the lower or upper back typically fails first. Alternatives: leg extension, hack squat, leg press.

DEADLIFT

Trains everything, which for hypertrophy purposes means nothing in particular. The lower back is usually the limiting factor. Better hamstring and glute options: Romanian deadlift, leg curl, hip thrust.

BENT-OVER ROW

One of the best loaded movements for the whole upper back when the position can be held. A problem when lower-back fatigue limits the set before the upper back has had a sufficient stimulus. If that is the case, take the spine out of it: chest-supported rows, cable rows and machine rows train the same musculature without the same spinal cost.

BARBELL BENCH PRESS

Excellent for short-armed lifters in whom the pectorals are the limiting factor. A problem for long-armed lifters, in whom the triceps or anterior deltoid fails first. Alternatives: pec deck, cable fly, machine chest press.

OVERHEAD PRESS

The front deltoids are usually already well trained by pressing movements. For physique development, lateral raises and rear deltoid work are often the more productive use of the same fatigue budget.

THE GENERAL PRINCIPLE

None of these lifts is bad. Each is a tool whose usefulness depends on the individual holding it. Judge a movement by which structure fatigues first, not by its reputation.

PRE-EXHAUSTION: AN EXERCISE-ORDER TECHNIQUE

Perform the isolation exercise first and the compound second. The target muscle is pre-fatigued and becomes the limiting factor in the compound even at lower loads. Cable fly into bench press for the chest; leg extension into squat for the quadriceps. It is most useful for trainees with a poor mind–muscle connection, for accommodating an injury, and for reducing absolute pressing loads while preserving the stimulus, which makes it a joint-preservation tool as much as an intensity one.

SECTION 10

Program Design

Structuring the training week and the longer plan

Training splits compared

A split is a scheduling device, not a training philosophy. Its only job is to distribute the required weekly volume at the required frequency, within the number of days the trainee will actually attend.

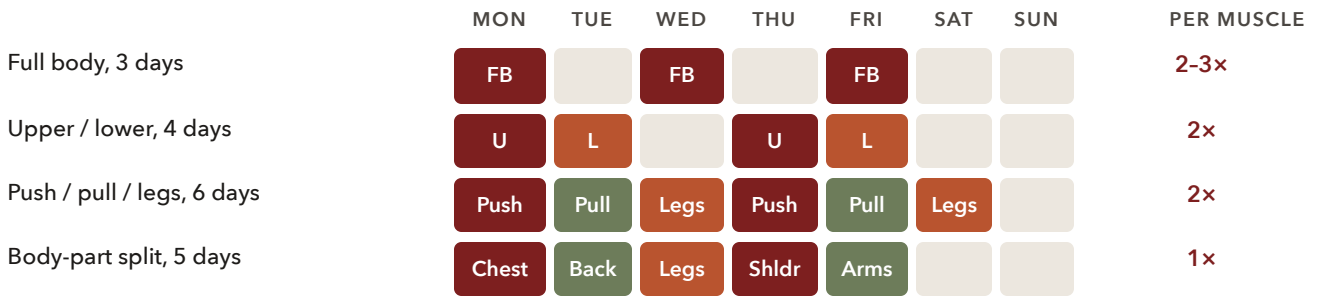

Figure 7. Four common weekly structures and the per-muscle frequency each achieves. The body-part split reaches each muscle only once per week, which is why it requires very high per-session volume to remain competitive.

Table 4. Split structures, frequency achieved, and the trainee each suits.

SPLIT	FREQUENCY	BEST FOR
Full body, 3 days	3× per week	Beginners. The historical gold standard and the most effective frequency for most athletes.
Upper / lower, 4 days	2× per week	Intermediates. The best balance of frequency against per-session volume.
Push / pull / legs, 6 days	2× per week	Intermediate to advanced trainees, and only when run twice through per week.
Body-part split, 5 days	1× per week	Low frequency and suboptimal for most. Viable only with very high per-session volume.

Session structure and exercise order

Within a session, order determines which exercises receive the trainee's best effort, because effort is a depleting resource. The default is compound movements before isolation movements, and the highest-priority muscle before everything else.

The reasoning is not that compounds are superior. It is that they are more sensitive to fatigue: a set of squats performed tired is both worse and more dangerous than a set of leg extensions performed tired. Pre-exhaustion, described in Section 9, is a deliberate inversion of this default, used when the compound is failing to reach the target muscle at all.

- Four to eight exercises per session is a workable range. Beyond that, either the session is too long or the later work is not hard enough to matter.
- Train the priority muscle first, on the day it is freshest. A lagging body part that is always fourth in the queue will stay lagging.
- Compounds before isolations, unless pre-exhausting on purpose.
- Where two exercises compete for the same muscle, put the one you are trying to progress first and treat the second as accessory volume.
- Antagonist supersets, described in Section 11, are the one reliable way to shorten a session without cutting quality.

Deloads

The purpose of a deload is to shed accumulated fatigue while preserving the adaptations that fatigue was purchased with. That determines exactly which variable to cut.

- **Keep the weight on the bar.** Maintain intensity.
- **Cut volume by up to two thirds,** but not below the weekly floor of roughly five hard sets per muscle. Within that band, muscle is fully preserved. A trainee running eighteen sets can drop to six; one running nine should drop to five, not three.
- Reducing volume does not cost muscle. Reducing intensity does.
- Strategic complete rest of a single muscle group can occasionally produce better development than continuing to train it.
- The discipline to hold back is worth as much as the discipline to push.

Warm-up protocol

- Three to five warm-up sets before working sets, as a maximum.
- Pyramid up progressively toward the working weight.
- Warm-up sets must not become working sets. Going to failure in a warm-up spends adaptive capacity before the real training has started.

SECTION 11

Special Techniques

Advanced tools, and the conditions under which they earn their fatigue cost

Every technique in this section increases effective-rep density per unit of time. Every one of them also increases fatigue. They are worth using once the basics are in place and progression on the main lifts has slowed. Not before, and never as a substitute for adding load.

DROP SETS

- Take the set to failure or near it, immediately reduce the load by twenty to thirty per cent, and continue.
- Creates metabolite accumulation beyond what a standard set to failure achieves.
- Best applied to isolation exercises rather than complex compounds.
- Use at the end of an exercise, not the beginning.
- Do not overuse. The fatigue cost is substantial and accumulates quietly.

ANTAGONIST SUPERSETS

- Alternate opposing muscle groups: biceps with triceps, chest with back.
- One muscle rests while the other works, which increases workout density without reducing per-set quality.
- Both muscles stay pumped, and neither goes fully cold between sets.

PARTIAL REPS

- **Bottom partials:** reps performed in the stretched position, which appear to produce additional stimulus beyond the equivalent full-range work.
- **End-of-set partials:** after full reps are exhausted, two or three partials extend the set past failure.
- Particularly effective on rows, flies and curls.

REST-PAUSE AND CLUSTER SETS

- Six to eight reps, rest twenty seconds, three reps, rest twenty seconds, two reps, rest, one rep; stop when only one rep is available.
- Maintains high motor unit recruitment throughout the cluster.
- Accumulates significant volume made up almost entirely of quality reps.
- Produces less accumulated fatigue than one extended set to failure of comparable stimulus.

BLOOD FLOW RESTRICTION

- Cuffs restrict venous outflow, forcing metabolite accumulation in the working muscle.
- Recruits high-threshold motor units at loads of only twenty to thirty per cent of maximum.
- Does not require training to failure; the metabolic environment supplies the signal.
- Best used for post-injury training and for adding volume without joint stress.

PART FOUR

Recovery and Energy

What determines how much of the training stimulus is converted into tissue, and how to manage the energy that pays for it.

IN THIS PART

12 Recovery
13 Nutrition

SECTION 12

Recovery

Muscle is built between sessions; recovery is half the program

Sleep

Sleep is the primary recovery tool, and it is non-negotiable. No supplement, protocol or technique compensates for poor sleep, and the trainee who is sleeping five hours a night does not have a programming problem. Prioritise it above every other recovery intervention, because the others are rounding errors by comparison.

Training stress and life stress share one pool

Training stress and life stress draw on the same recovery capacity. A demanding week at work, disrupted sleep or personal difficulty all reduce how much training the body can absorb. When life becomes demanding, temporarily reducing training volume is a correct programming decision, not a setback.

The failure mode: too much, too consistently

The most common recovery error is not training too hard in a single session. It is accumulating more total volume than the body can recover from, week after week. Progress stalls, motivation drops, and small injuries begin appearing in sequence. The fix is to reduce volume temporarily, not to push through. Recovery is part of the program, not an interruption to it.

ON CONSTANTLY VARIED, HIGH-SKILL PROGRAMMING

Programming that varies constantly without systematic progression, and that incorporates high-skill movements such as the Olympic lifts under conditions of accumulated fatigue, creates an outsized injury environment. Systematic adaptation and controlled load progression are not arbitrary constraints imposed by cautious coaches. They are what separates training from random physical stress.

Injury prevention

- ✓ **Warm up properly.** Three to five pyramid sets, with specific attention to the joints involved: elbows before arm work. Never go from cold to working weight.
- ✓ **Ensure the target muscle fatigues first.** If a different structure hurts or fatigues before the target does, the wrong tissue is being stressed and an injury is being accumulated.
- ✓ **Stop short of full lockout on leg extensions.** Patellar tendon stress rises steeply near full extension. The last few degrees are high risk and low reward.
- ✓ **Respect the load on heavy bench press.** Pectoral tears are a real risk at heavy loads. Pre-exhausting with flies reduces the required pressing load while maintaining the stimulus.
- ✓ **Do not add weight too quickly.** Connective tissue adapts far more slowly than muscle. Aggressive jumps cause tendon and ligament failure while the muscle still feels capable.
- ✓ **No heroics in peak week (competitors).** Contest week is not the time to test maxes or introduce new exercises. Seventy per cent intensity, pump work only.

SECTION 13

Nutrition

Calories, macronutrients, fat loss phases, and long-term adherence

> *Fat loss has one non-negotiable condition at the physiological level: energy intake must fall below energy expenditure over time. Every diet that produces results achieves this in one way or another. The approach is secondary; the deficit is primary.*

0.5% Body weight per week: conservative rate of fat loss for a first diet	**1%** Body weight per week: maximum rate for experienced dieters	**12 wk** Maximum length of a single diet phase	**10%** Maximum body weight lost in a single phase
500 Daily calorie deficit producing roughly 1 lb (0.45 kg) per week	**20–30%** Of total calories from fat: practical floor for hormonal health	**3–5** Meals per day	**4–6 hr** Practical spacing between meals

Step one: track before changing anything

Before altering the diet, track current intake for one to two weeks without changing it. The objective is to establish maintenance calories and average protein, carbohydrate and fat intake. Every subsequent manipulation (deficit, surplus or maintenance) is built from that number, and a manipulation built on a guess is a guess.

- Use any food-tracking tool. The specific application matters far less than the habit of using it consistently.
- Do not begin a deficit at the same time as beginning to track. Too much change at once substantially increases the failure rate.

Macronutrients

PROTEIN · 4 KCAL PER GRAM

The most important macronutrient: it preserves muscle, stabilises blood sugar and maximises satiety. Keep intake roughly equal across meals. When creating a deficit, protein is never the variable that gets cut.

CARBOHYDRATE · 4 KCAL PER GRAM

The primary energy source. Place more carbohydrate before and after training, when it is most readily used. Reduce intake at meals far from training, such as early morning or pre-bed on non-training days.

FAT · 9 KCAL PER GRAM

Digests slowly, so high-fat meals are poorly placed around training. Do not reduce dietary fat too aggressively: fat is essential for hormone production, and a large sustained drop can disrupt testosterone and other anabolic hormones.

ORDER OF REDUCTION

Increase physical activity first, which reduces the deficit required from food. Then reduce fat moderately, as the most calorie-dense macronutrient. Then reduce carbohydrate once fat approaches its floor. Protein remains constant throughout.

Protein: how much, and why the number stops mattering

Total daily protein is the figure that determines outcomes, and it is the one number in this section worth being precise about.

For a trainee eating at or above maintenance, roughly 1.6 g per kilogram of body weight per day (about 0.73 g per pound) is the point beyond which the meta-analytic evidence stops showing additional gains in lean mass. A practical working range of 1.6 to 2.2 g/kg (0.73 to 1.0 g/lb) covers the measurement error, the day-to-day variation in intake, and the fact that nobody hits their target exactly.

Two situations justify going higher. During an energy deficit, protein requirements rise as the body becomes more willing to oxidise amino acids for fuel, and lean trainees in aggressive deficits do better toward 2.3 to 3.1 g per kilogram of fat-free mass. Older trainees also respond less to a given dose and benefit from the upper end of the range.

Above those figures the returns are not merely diminishing; they are absent. Protein beyond requirement is not harmful in healthy people. It is simply expensive food occupying calories that carbohydrate could have used more productively around training.

- **Worked example:** an 80 kg (176 lb) trainee targets 128 to 176 g per day.
- Split it roughly evenly across three to five meals, at 0.4 g/kg or more per meal. Even distribution is easier to hit than it is important.
- Whole-food sources first; powder is a convenience, not a category.
- In a deficit, this is the number that is held constant while everything else moves.

Building a meal

- **Lean protein:** a fist-sized portion of chicken, fish, turkey or lean tofu, plus 230 to 350 g (8 to 12 oz) of dairy or a protein shake.
- **Vegetables:** one to four fist-sized portions; grilled, steamed or raw, and not soaked in fat.
- **Whole grains or fruit:** brown rice, oats, wholegrain bread or pasta; fresh fruit rather than blended or syruped.
- **Healthy fats:** nuts, nut butters, avocado, olive oil, in moderation.

> *Simplification is the key to adherence. Pick two to four go-to proteins, vegetable combinations, carbohydrate sources and fats, and rotate them. Batch cook twice a week and portion into containers. This reduces decision fatigue dramatically, and decision fatigue is what ends most diets.*

Meal timing

Total daily protein is what tracks results. Timing is a distant second, and it matters mainly because a schedule makes the daily total easier to hit. The one-hour post-workout window did not survive meta-analysis: once total protein is matched, the timing of the post-training meal makes no detectable difference. Treat the table below as a practical structure rather than a set of physiological rules.

Table 5. A workable daily meal structure.

MEAL	TIMING RULE	CARBS	FATS
First meal	Within a few hours of waking, to start the day's protein total	Moderate	Mod–high
Pre-workout	Before training, to provide energy for the session	High	Low
Post-workout	Within a few hours of finishing; convenient rather than urgent	Highest	Low
Between meals	Roughly every four to six hours, spacing that makes the total easy to hit	Moderate	Moderate
Pre-bed	One to two hours before sleep, to limit hunger and supply overnight amino acids	Low	Mod–high

The surplus phase: eating to gain

Everything above this point concerns losing fat or holding weight steady. Building muscle at a meaningful rate requires the opposite condition, and the same discipline applied in the other direction.

A surplus of roughly 10 to 20 per cent above maintenance, which for most athletes is 200 to 500 calories, is enough. Larger surpluses do not accelerate muscle gain; the rate at which muscle can be built is set by training, recovery and training age, not by the size of the surplus. Anything beyond what that ceiling can absorb is deposited as fat, and the fat then has to be dieted off, which costs training time and some of the muscle that was just built.

Table 6. Expected rate of weight gain by training age, in a surplus.

TRAINING AGE	RATE PER MONTH	NOTES
First year	1 to 1.5% of body weight	The fastest muscle gain available in a lifetime. Do not squander it with an unnecessarily large surplus.
Second to third year	0.5 to 1%	Progress remains visible month to month, but the margin for sloppy eating narrows.
Advanced	0.25% or less	Gains are measured over quarters. A surplus at the top of the range buys almost nothing but fat at this stage.

- Track weekly average body weight, not daily readings. If the average is not moving after two to three weeks, add 150 to 250 calories.
- If the average is climbing faster than the table above, the surplus is too large. Remove calories rather than adding cardio.

– Protein stays in the 1.6 to 2.2 g/kg range. Additional calories come mostly from carbohydrate, which also supports training performance.
– Run the phase for long enough to matter. Four to six months is a reasonable block; six weeks is a rounding error.
– End the phase when body fat reaches the upper edge of what you are willing to diet back off, not when motivation runs out.

WHY A BIGGER SURPLUS DOES NOT WORK

The ceiling on muscle gain is biological, and it is low: a well-trained athlete may add a couple of kilograms of lean tissue in a good year. A 1,000-calorie surplus does not raise that ceiling. It simply adds fat at roughly the rate the arithmetic predicts, while the muscle accrues at the rate it was always going to. The traditional bulk-and-cut cycle is not wrong in principle; it is usually wrong in magnitude.

Sizing the deficit

A reasonable starting point is a daily deficit of 300 to 500 calories for most athletes, producing approximately 0.5 to 1 lb (0.25 to 0.45 kg) of weight loss per week while preserving training performance and muscle mass. Heavier athletes can sustain a larger absolute deficit; lighter athletes should stay at the conservative end.

Start modest. The deficit can always be increased if progress stalls. Going aggressive on day one leaves nowhere to adjust when the diet inevitably slows, which is the point at which an adjustment is most needed.

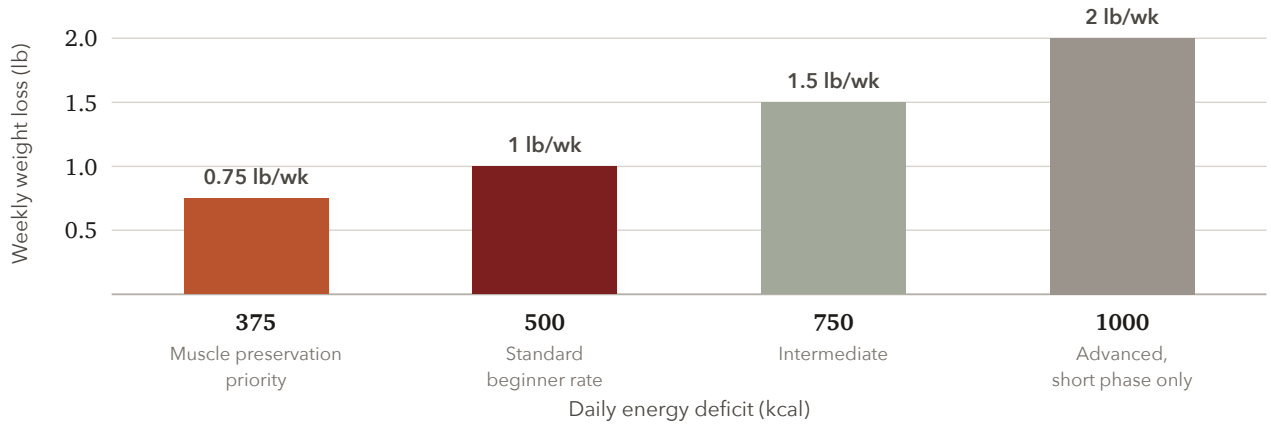

Figure 8. Daily energy deficit against expected weekly rate of loss, with the trainee each is appropriate for. Rates above one per cent of body weight per week increase muscle loss and diet dropout in roughly equal measure.

Hunger and scale management

HUNGER MANAGEMENT

Prioritise foods that are more filling per calorie: fresh fruit, raw vegetables, Greek yoghurt, lean protein. Avoid hyper-palatable foods while in a deficit, since they amplify cravings. Expect to eat blander food as the diet progresses, and time the largest meals to personal hunger peaks.

WATER WEIGHT AND THE SCALE

It is normal to retain water while actively losing fat. Common causes are high stress, poor sleep, excess salt and a high volume of artificially flavoured drinks. Standardise salt intake and fluid intake, and cap flavoured drinks at a fixed daily number so the signal is not swamped by noise.

WHEN PROGRESS STALLS

If the target rate of loss has not been achieved for two or more consecutive weeks, remove a further 250 calories from a combination of fats and carbohydrates. Repeat after another two stalled weeks if necessary. Do not make this adjustment on the basis of a single week; weekly weight is noisy enough that one flat week carries almost no information.

The maintenance phase, and why it is mandatory

> *Fat regain is primarily a failure of the post-diet period. After fat loss the body drives hunger up, increases the appeal of calorie-dense food and reduces spontaneous activity. Skipping a structured maintenance phase leaves that drive entirely unopposed.*

Maintenance phase duration should roughly equal the duration of the diet that preceded it. This is the single most commonly ignored instruction in this section, and the one most responsible for the familiar pattern of loss followed by complete regain.

01 **Do not reintroduce junk immediately.** Stay with the diet foods and simply remove the deficit. The same meals, in larger quantities.

02 **Add back roughly half the removed calories.** A trainee who maintained at 3,000 and dieted at 2,000 begins maintenance at approximately 2,500.

03 **Expect around two per cent immediate weight gain.** This is water re-compartmentalisation and glycogen restoration, not fat. It is normal and expected. Do not panic and re-diet.

04 **Adjust in 250-calorie increments.** Dropping below end-of-diet weight means adding 250. Climbing above it means removing 250. Repeat until weight is stable.

05 **Reintroduce treats only after three to four weeks of stability.** If weight trends upward for two or more weeks after reintroduction, reduce treats or trim dietary fat slightly.

Multi-phase fat loss

– **Avoid extended single phases.** Diminishing returns set in and metabolic adaptation accelerates after ten to twelve weeks of dieting.

- **Build structured maintenance periods between phases.** Do not chain deficits back to back; the body needs time to re-establish its hormonal baseline and clear diet fatigue.
- Begin a new phase only once appetite and energy have normalised, cravings have subsided, and weight has stabilised.
- Expect each subsequent phase to produce less absolute weight loss. This reflects hormonal and metabolic adaptation. It is expected, and it is not failure.
- Finish the final phase slightly below the long-term target weight. Food reintroduction and normal living will push the number back up on their own.

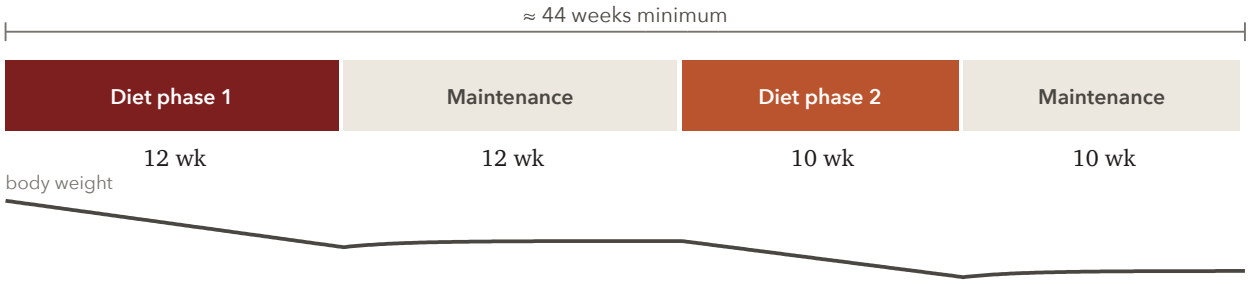

Figure 9. A two-phase fat loss structure with matched maintenance periods. Total elapsed time is considerably longer than the dieting time, which is the point: the maintenance blocks are what make the result durable.

Getting exceptionally lean COMPETITORS

THRESHOLDS

For males, lean is under ten per cent body fat and exceptional is around five per cent, with visible vascularity and abdominal definition. For females, lean is under seventeen per cent and exceptional around twelve. Neither is a health requirement; both are purely aesthetic, and both are always followed by a full maintenance phase.

MINIMUM TIMELINE

At least two diet phases are required: phase one reaches lean, then maintenance, then phase two reaches exceptional. Minimum total timeline is 27 to 36 weeks before the final maintenance phase, with weight training three to four times per week throughout. That training is what differentiates muscular leanness from simply being thin.

Considerations for female athletes

Almost everything in this document applies to women without modification. The training principles are not sex-specific, and the recommendation to train hard, progress load and manage volume against recovery is the same recommendation. Four practical differences are worth stating explicitly, because ignoring them produces avoidable frustration.

- **Scale noise is larger and partly cyclical.** Fluid retention across the menstrual cycle can mask one to two kilograms of real change. Compare weekly averages at the same point in successive cycles rather than week to week, and expect a flat or rising fortnight that resolves on its own.
- **Absolute deficits should be smaller.** The rate guidance of 0.5 to 1 per cent of body weight per week still holds, but a lighter athlete's one per cent is a much smaller calorie figure. Applying a standard 500-calorie deficit to a 55 kg (121 lb) trainee is an aggressive cut, not a moderate one.

- **The essential body fat floor is higher.** The thresholds given above reflect this. Driving further down carries costs to menstrual function, bone density and recovery that have no equivalent in men, and those costs are the reason such phases are always time-limited and always followed by full maintenance.
- **Lower-body work is often better tolerated.** Many female trainees recover from higher lower-body volumes and higher rep ranges than the defaults here assume. Treat the ranges as a starting point and let the training log adjust them.

Supplements

- **Creatine monohydrate, 3 to 5 g daily.** The most thoroughly studied performance supplement in existence: more strength, more power, more muscle. Timing is irrelevant, no loading phase is required, and plain monohydrate is the only form worth buying.
- **A multivitamin and multimineral,** one daily, to fill dietary gaps. Insurance rather than enhancement.
- **Vitamin D,** particularly with low sun exposure. Test first, then dose to the result rather than to a blanket number.
- **Fish oil,** which has decent evidence for anti-inflammatory effects and for those who eat little fish, and mixed evidence for cardiovascular outcomes in healthy people. Likely helpful, not transformative.
- **Everything else:** no meaningful evidence for the general population.

Hydration

- Drink one calorie-free beverage with every meal, and more when thirsty. Water, sparkling water and diet drinks all count.
- Urine check: pale yellow to clear indicates adequate hydration; dark yellow or brown indicates the opposite.
- During fat loss, cap artificially flavoured drinks. High volumes increase salt cravings and contribute to water retention that obscures progress.

Long-term adherence

> *Healthy eating becomes a habit rather than an act of willpower when it is structured correctly. The goal is a system automatic enough that it requires no decisions: known foods, a known schedule, a known preparation routine.*

- Batch cook twice per week and pre-portion into containers.
- Keep two to four options per food category, deliberately limiting variety during a deficit.
- Carry emergency foods: jerky, nuts, protein bars, fresh fruit.
- One difficult weekend or holiday does not derail progress. Return to the plan and continue.
- Check body weight roughly every two weeks. If the trend is upward, tighten for two weeks, then relax again.

– If dieting has become exhausting, remaining in healthy balance indefinitely is a legitimate outcome, not a failure to finish something.

Common nutrition mistakes

01 · FOCUSING ON QUALITY INSTEAD OF QUANTITY

Eating clean but eating too much. Food quality matters, but a caloric surplus from clean food still produces fat gain.

02 · NOT TRACKING BEFORE MANIPULATING

Estimated portions are systematically underestimated. A deficit cannot be built from a number nobody knows.

03 · SKIPPING MAINTENANCE

The single largest reason fat loss is regained. The biological drive to regain is real, and maintenance is the only countermeasure.

04 · GOING TOO AGGRESSIVE TOO EARLY

Exceeding one per cent of body weight per week increases both muscle loss and dropout. Slow phases completed beat fast phases abandoned.

05 · CUTTING PROTEIN TO REDUCE CALORIES

Protein is the last thing to cut. Reducing it during a deficit accelerates muscle loss and increases hunger simultaneously.

06 · HIGH-FAT MEALS AROUND TRAINING

Fat slows digestion, so a heavy fatty meal before training sits in the stomach and degrades the session. This is a comfort and performance issue, not a matter of fat blocking absorption, which it does not do.

PART FIVE

The Long View

How the rules change with training age, the psychology that decides whether any of this gets done, and the numbers at a glance.

IN THIS PART

14 Training Age and Periodisation
15 Mindset and Application
16 Quick Reference
17 Glossary and Further Reading

SECTION 14

Training Age and Periodisation

How experience changes the rules

What changes between year one and year five

EARLY TRAINING · 0–2 YEARS

Nearly any structured program produces results, because the stimulus threshold is low. Technique development is the priority rather than loading. Recovery is fast, and connective tissue is still adapting. Progression is close to linear: weight can be added almost every session. Simple programs outperform complex ones at this stage, reliably.

ADVANCED TRAINING · 5+ YEARS

The stimulus required to produce adaptation rises significantly. More volume, higher intensity and greater specificity all become necessary. Progress is measured in months rather than weeks. Periodisation becomes essential because linear progression is no longer viable, and injury management and long-term structural health become primary concerns.

Periodisation approaches

LINEAR PERIODISATION

Add weight or reps every session or every few sessions. Works until plateaus become frequent, which for most trainees is somewhere in the first two years. Ideal for beginners because it is simple and effective, and there is no reason to abandon it while it continues to work.

BLOCK PERIODISATION

Focus on a single quality (strength, volume or intensity) for a block of four to eight weeks, then shift emphasis. Allows genuine specialisation without overreaching, because only one quality is being pushed at a time.

DAILY UNDULATING PERIODISATION

Vary intensity and volume within the same week: heavy fives on Monday, moderate eights on Wednesday, higher-rep twelves to fifteens on Friday. Not for beginners. It introduces a great deal of complexity before the foundations are solid, and complexity is the enemy of the consistency that beginners need most.

SECTION 15

Mindset and Application

The psychological determinants of long-term success

> *Most people end their sets when it becomes uncomfortable, not when another rep is genuinely unavailable. The last few reps before real failure are where the growth signal is strongest. Learning to push through discomfort, though not pain, is one of the most important skills in training.*

Consistency beats the perfect program

A decent program followed consistently for months beats an excellent program followed half-heartedly. Most people do not need a better program; they need to actually follow the one they have. Show up, do the work, track the numbers, repeat.

Most people do not train hard enough

Most gym-goers stop their sets well before they need to, at the point of discomfort rather than the point of failure. Real training effort means the final rep is genuinely hard. This is a skill that improves with practice, and it is one of the largest single factors separating those who progress from those who do not.

What works for you is what you will actually do

There is no single best program. There are principles, and then there is a specific situation with a specific schedule, a specific set of equipment and a specific person. The best training structure is the one that will be sustained. Sustainable beats optimal-on-paper every time.

A training partner makes a real difference

Having someone to train with, or simply to check in with, consistently improves both effort and attendance. Long-term consistency is the largest driver of results, and accountability is one of the simplest and cheapest ways to protect it.

Knowing when to back off

The discipline to reduce training when the body requires it is as important as the discipline to train hard. Planned deloads, backing off when something hurts, and managing volume during demanding periods of life are skills. They are not weaknesses, and treating them as such is how promising trainees end up injured.

SECTION 16

Quick Reference

The parameters of this document on a single spread

Table 7. Training parameters at a glance.

PARAMETER	RECOMMENDATION
Weekly sets per muscle group	10–16 hard working sets
Sets per muscle per session	5–10 maximum
Training frequency	2× per week per muscle group
Hypertrophy rep range	6–12 reps
RIR target	0–3 RIR, i.e. within three reps of failure
Effective reps per set	The last five reps of any set taken near failure
Effective reps per muscle per session	20–40, conservative end for most
Value of one extra rep	Approximately 2–3% additional load
Eccentric tempo	Controlled, roughly 1–4 seconds. Do not drop the weight; do not crawl
Upper-body increment	2–2.5 kg (5 lb)
Lower-body increment	5 kg (10 lb)
Warm-up sets	3–5 per exercise, maximum
Exercises per session	4–8
Plateau protocol	Hold the load 3–4 weeks, rep out, add weight on 2+ extra reps
Peak week training weight	70% of normal (competitors)
Deload volume reduction	Up to two thirds, never below 5 sets per muscle; muscle is maintained

Table 8. Nutrition parameters at a glance.

PARAMETER	RECOMMENDATION
Protein, at or above maintenance	1.6–2.2 g/kg body weight per day (0.73–1.0 g/lb)
Protein, in a deficit	Toward 2.3–3.1 g/kg of fat-free mass

Protein per meal	0.4 g/kg or more, across 3–5 meals
Dietary fat floor	20–30% of total calories
Meals per day	3–5, spaced roughly 4–6 hours apart
Fat loss rate	0.5% of body weight per week (first diet) to 1% (experienced maximum)
Starting deficit	300–500 kcal per day
Deficit adjustment	250 kcal after two consecutive stalled weeks
Maximum diet phase	10–12 weeks, or 10% of body weight
Maintenance phase length	Roughly equal to the preceding diet
Surplus size	10–20% above maintenance, or 200–500 kcal per day
Rate of gain, first year	1–1.5% of body weight per month
Rate of gain, advanced	0.25% of body weight per month or less
Creatine monohydrate	3–5 g daily, no loading phase, timing irrelevant
Weigh-in cadence	Weekly averages; review every two weeks

Universal agreements

Coaches disagree about a great deal. The following propositions are endorsed by essentially everyone who has produced results with real athletes over a long period, across otherwise incompatible methodologies.

- ✓ Full range of motion is essential. Do not cut the movement short.
- ✓ Warm-up sets must not become working sets.
- ✓ Training intensity must be sufficient for growth. Going through the motions is not training.
- ✓ Progressive loading over time is the goal, and everything else is in service of it.
- ✓ Volume must be managed relative to recovery capacity, which is finite and varies week to week.
- ✓ The target muscle must actually receive the stimulus. Exercise selection and mind–muscle connection are how that is ensured.

SECTION 17

Glossary and Further Reading

Terms used in this document, and where the arguments come from

Table 9. Terms as they are used in this document.

TERM	MEANING
1RM	One-repetition maximum: the heaviest load that can be lifted once. Used here mainly as a percentage to describe load.
BFR	Blood flow restriction. Cuffed training at 20–30% of maximum, which forces metabolite accumulation and recruits high-threshold motor units at low load.
DOMS	Delayed-onset muscle soreness. A separate process from the signalling that drives growth, and a poor feedback signal.
Double progression	Adding reps within a fixed range at a fixed load, then adding load and resetting to the bottom of the range.
DUP	Daily undulating periodisation. Varying intensity and volume within a single training week.
Effective rep	A rep performed while the full motor unit pool is recruited. Concentrated in the last five reps of a set taken near failure, or in every rep of a heavy set.
Fat-free mass	Total body mass minus fat mass. Used as the reference for protein targets in an aggressive deficit.
Junk volume	Sets that add fatigue without adding growth signal, either because effort was too low or because the session's stimulus was already saturated.
Maintenance phase	A structured period at maintenance calories following a diet, of roughly the same length as the diet.
Metabolic adaptation	The reduction in energy expenditure and the rise in appetite that accompany sustained dieting.
Microloading	Plates of 0.5–1.25 kg, used to continue linear progression once standard increments are too large.
Pre-exhaustion	Performing the isolation exercise before the compound so that the target muscle becomes the limiting factor.
Rest-pause	A set broken into clusters by short rests, maintaining high recruitment across a larger number of quality reps.
RIR	Reps in reserve: how many further reps could have been completed when the set was stopped.

Training age	Years of consistent, structured resistance training. The variable that determines how much of this document still applies.
Working set	A set taken within roughly three reps of failure. Warm-up sets are never counted as working sets.

Further reading

This document is a synthesis, not a review, and it carries no citation apparatus. The list below is where the arguments in it come from and where a reader who wants the primary evidence should go next. It is ordered by the section of this document each body of work bears on.

- **Volume, frequency and rep ranges (Sections 4, 6, 8).** The meta-analytic work of Brad Schoenfeld and colleagues is the standard reference for dose–response in each of these variables, and for the finding that rep ranges from roughly five to thirty produce equivalent hypertrophy when effort is matched.
- **Effective reps and motor unit recruitment (Section 5).** Chris Beardsley has done the most to develop and popularise this framework, and also the most to mark its limits. Read him for the model and for the caveats in the same place.
- **Program structure and effort calibration (Sections 7, 8, 10).** Eric Helms and co-authors, in *The Muscle and Strength Pyramids* and in their work on RPE-based load prescription, set out the hierarchy-of-importance approach that this document's organisation follows.
- **Volume landmarks and per-session ceilings (Sections 4, 10).** Mike Israetel and the Renaissance Periodization group popularised the minimum-effective, maximum-adaptive and maximum-recoverable framing that the floor and ceiling language here condenses.
- **Energy balance, diet phases and diet breaks (Section 13).** Lyle McDonald's writing remains the most practically detailed treatment of deficit sizing, diet fatigue and the structured maintenance phase.
- **Protein requirements (Section 13).** The meta-analysis of Robert Morton, Stuart Phillips and colleagues (2018) established the figure at which additional protein stops adding lean mass; Eric Helms and colleagues (2014) supply the higher targets appropriate to lean athletes in a deficit.
- **Nutrient timing (Section 13).** The meta-analysis by Brad Schoenfeld, Alan Aragon and James Krieger (2013) on the post-exercise window is the source of the position taken here, which is that total daily intake dominates and timing is a convenience.
- **Training intensity and the high-intensity tradition (Sections 1, 3, 11).** Arthur Jones, Mike Mentzer and Dorian Yates argued the effort-over-volume case long before there was a literature to support any of it. They were not right about everything, and they were right about effort.
- **General critical coverage.** The Stronger By Science group, particularly Greg Nuckols, is the most reliable ongoing source for evaluating new training research without either credulity or contrarianism.

HOW TO READ A TRAINING STUDY

Three questions settle most of them. Were the subjects trained, or were they beginners in whom almost anything works? Was effort equated between conditions, or is the high-volume group simply the group that trained harder? And was the trial long enough for the difference to be anything other than noise? An eight-week study on untrained undergraduates can be perfectly well conducted and still tell you nothing about what to do with a client of ten years' standing.

A closing note

Nothing in this document is complicated. The difficulty of training has never been informational. It is that the correct actions are unexciting and must be repeated for years before the result is visible, while the incorrect actions are novel, stimulating and produce an immediate sensation of effort. A coach's real work is mostly the management of that asymmetry, in clients and in themselves.

Hypertrophy Training: Principles That Work · 2026 Reference Edition · Vladimir Brusov
Set in Charter and Avenir Next. Figures drawn to the values stated in the text.