

MUSCLE AFTER 40

— TRAINING | PROTEIN | RECOVERY —

RESEARCH MADE PRACTICAL

What matters for strength, muscle, and healthy aging.



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● ABOUT THIS GUIDE

Strength that fits real life

A practical explanation of how to build and preserve muscle, eat to support your training, and keep the plan working as life changes.



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Emil's experience spans working adults, stay-at-home parents, business owners, law-enforcement and military personnel, physicians, and athletes. He created these guides to make research on strength, nutrition, and healthy aging easier to understand and use in real life.

SINCE 2011
HEALTH & FITNESS
EXPERIENCE

These self-guided resources are not an offer of coaching, healthcare, or individualized services.

Who this is for

This guide is for generally healthy adults, with a special focus on life after 40. Men and women can use the same basic principles. Your starting strength, experience, health, available time, and ability to recover determine how you apply them. It is not a children's program or a substitute for rehabilitation, pregnancy-specific care, or treatment of a medical condition. [A7, A10, A11]

Two guides, two jobs

Read this guide for the "why." Use the companion *Stronger for Life* program for the "what to do": five weekly schedules, complete workout cards, a 16-week plan, food-planning tools, and logs. You do not need to memorize the science before your first session.

How to read the research notes

Small labels such as [S31] point to research from the underlying review. Labels such as [A8] point to additional studies or official guidance. The source list explains each label and includes a link. Training calendars, example meals, and adjustment rules are practical coaching choices, not a single program proven best in a clinical trial.

A USEFUL BOUNDARY

This is general education, not a personal medical prescription or a promise of results. Use your clinician's or dietitian's advice when a health condition changes what is safe or appropriate.

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Read from the beginning, or go straight to the question on your mind.

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 THE ESSENTIALS

You do not need a perfect routine

You need a plan you can do well, recover from, and repeat.

Being over 40 does not create one correct workout for everyone. A person returning after years away and a person who has trained for decades may need very different starting points. The useful question is not “What should someone my age lift?” It is “What can I do consistently, and how is my body responding?”

Building muscle, becoming stronger, and making everyday tasks easier are related goals, but they are not identical. A successful plan can improve the weight you lift, the ease of climbing stairs, or your confidence carrying groceries, even when visible changes are slow.

The research reviewed here supports a steady foundation: strength training that becomes gradually more demanding, enough protein, enough total food, and a routine you can sustain. The exact best number of sets, meal times, or grams of carbohydrate is much less certain. [\[S5, S11, S31, S50, S65\]](#)

The priorities, in a useful order

- 1** Choose a schedule you can keep. Two well-planned days are a real option. More days can help divide the work, but they are not an automatic upgrade.
- 2** Learn the movements and make the sets count. Use a stable setup, controlled repetitions, and an appropriate challenge.
- 3** Build slowly. Add repetitions or a little weight when you are ready, rather than chasing exhaustion.
- 4** Support the work with food and recovery. Keep protein, total intake, sleep, and how you feel in the same conversation.

The 2026 American College of Sports Medicine overview brought together 137 systematic reviews involving more than 30,000 participants. Strength training improved several measures of muscle and physical performance. A routine can therefore be useful without being “optimal” in every detail. [\[S11\]](#)

WHAT THIS MEANS FOR YOU

Start with a manageable version. Repeat it long enough to learn from it. Let your results and recovery, rather than a birthday, a stereotype, or a more complicated template, guide the next change.

● 01 / YOUR BODY AND AGING

What changes after 40?

Age matters, but it is not the only thing that matters.

Researchers use the term anabolic resistance for a smaller muscle-building response to a given amount of protein or exercise. In everyday language, the same input may produce a weaker response. Aging can contribute, but so can inactivity, illness, and inadequate food. It is not a switch that flips on your 40th birthday. [S7, S9, S10]

That is why a fixed claim such as "everyone over 40 responds 30% less" is too broad. People of the same age can differ substantially in training history, health, and current activity. Average rates of muscle loss in a study do not predict exactly what will happen to you each year. [S7, S72]

Activity changes the picture

Research on older athletes helps separate age from lifestyle. People who remain active can retain characteristics closer to those of younger athletes than to inactive people their own age. This does not mean exercise erases aging. It does mean age alone is a poor reason to stop challenging your muscles. [S10]

A laboratory signal is not a long-term result

Muscle protein synthesis is the process of making muscle proteins. Researchers can measure it over hours or days. A larger short-term response does not, by itself, prove that someone will build more muscle over a year. Likewise, "lean mass" on a body-composition test includes water and other non-fat tissue; it is not a pure muscle measurement. [S9, S31, S72]

Use your present ability as the starting point

Past experience can help you relearn exercises, but a weight you lifted years ago is not evidence that you are ready for it today. On the other hand, a healthy person who has trained consistently does not need to reduce everything to one easy set simply because they are older.

TRY THIS

Track a few repeatable exercises, how everyday tasks feel, and whether you recover between sessions. Those observations are more useful than assuming that age determines your training limit.

RESEARCH IN VIEW / ACTIVITY AND PROTEIN

Why staying active matters

This illustration compares an older trained athlete with an older untrained adult. It helps explain a concept; it does not calculate your meals.

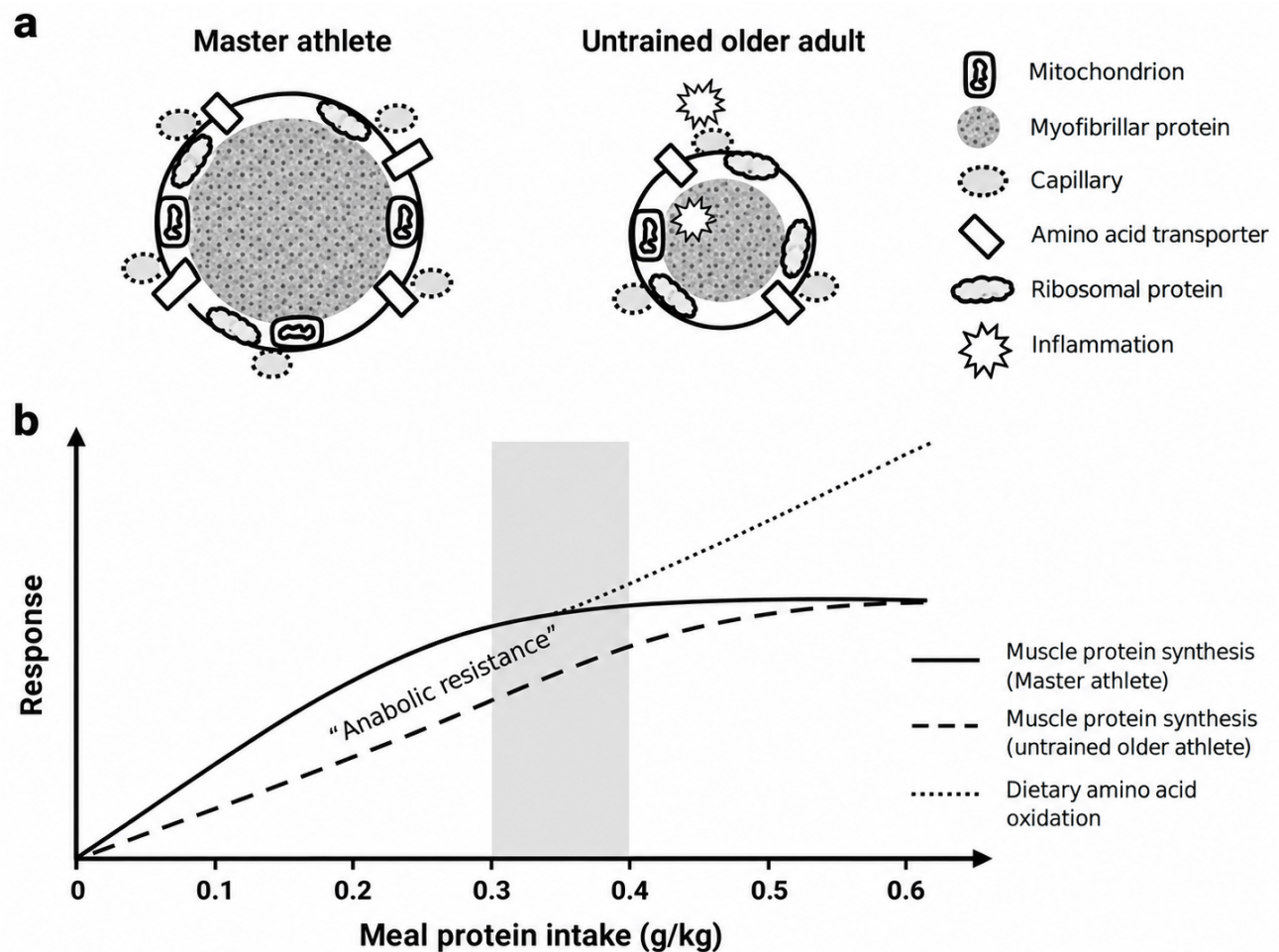


Figure 1. Conceptual comparison based on Moore (2021), showing proposed activity-related muscle characteristics and the acute response to meal protein. It is a schematic, not a measured comparison. [S10]

THE USEFUL TAKEAWAY

Regular activity is relevant to how your muscles respond to food and exercise. Keep both in the plan.

Do not read this as: a guaranteed protein threshold, a prediction of your personal response, or proof that training removes every effect of aging. The curves are a schematic illustration, not individual clinical measurements.

How much training is enough?

The goal is enough useful work, not the largest number of sets you can survive.

A set is a group of repetitions. Weekly volume is the amount of training you complete over the week. When comparing advice, check what is being counted: sets for one exercise, for one muscle, or for the entire lower body. Those numbers are not interchangeable. Easy warm-up sets are separate from working sets.

A review of 151 trials in adults aged 60 and older found that lower-volume programs could improve important outcomes. But "12 lower-body sets" does not mean 12 sets for every leg muscle, and it does not establish an age-related ceiling on useful training. [S5]

Other research links more weekly sets with greater muscle growth, but with diminishing returns: the benefit from each extra set tends to become smaller, while time and fatigue still add up. The evidence also contains substantial uncertainty. [S11, S12, S13]

Starting point	A practical way to begin
New or returning	Start with 1-2 working sets per exercise. Some muscles may initially receive only about 4-6 direct sets per week.
A repeatable base	Often about 6-12 useful weekly sets for a priority muscle, using a consistent way to count overlap.
Experienced and recovering well	Consider additional work for selected muscles, rather than every muscle at once, when there is a reason to add it.

These are coaching starting zones, not proven age-specific thresholds. A lower dose can still help. Some experienced people use more. "No clear difference" in a study also does not prove that every dose is equally effective for every person.

BEFORE YOU ADD ANOTHER SET

Check attendance, effort, technique, food, and sleep. When those are in place and progress has genuinely stalled, a small targeted increase is one option. When recovery is getting worse, more work is usually not the first change to test.

RESEARCH IN VIEW / WEEKLY SETS

More sets bring diminishing returns

The model found a positive average relationship with diminishing returns. It is not a growth calculator for an individual.

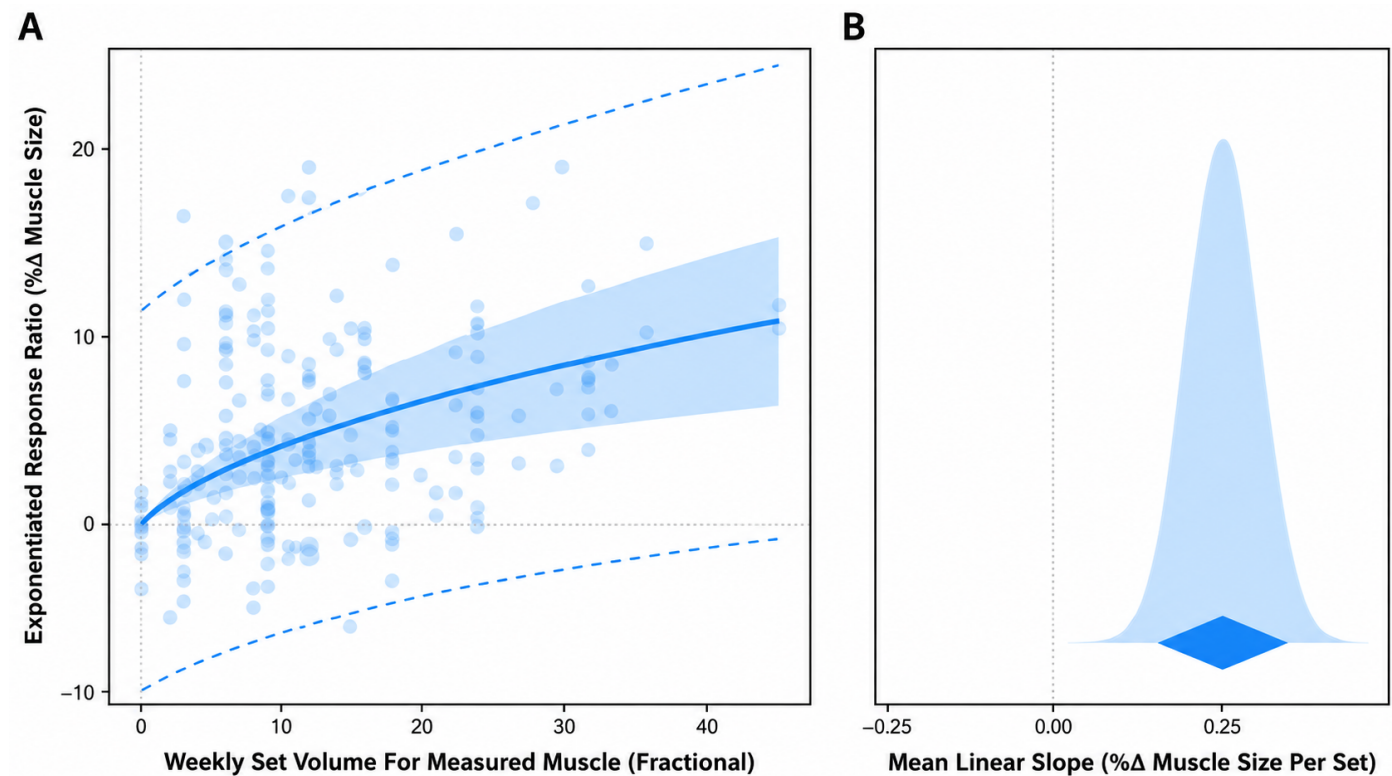


Figure 2. Pelland and colleagues' (2026) square-root model included 35 studies, 220 effects, and 1,032 participants. At the model's average volume, the marginal slope was 0.24% muscle-size change per additional weekly fractional set (95% credible interval 0.15% to 0.33%), while the overall curve showed diminishing returns. [S12]

The useful lesson is that a set can contribute to progress without every added set contributing equally. A smaller plan may deliver meaningful benefit. A larger plan may also suit you, but it costs more time and recovery.

A SIMPLE COUNTING EXAMPLE

Three bench-press sets count as three direct chest sets. Under one tracking method, they might also count as about 1.5 indirect triceps sets. This is a bookkeeping choice, not a biological law.

Do not use the highest number on the graph as a recommendation. The companion program shows its actual set totals and gives rules for changing them. That is more useful than chasing the end of a research curve.

How often, and how heavy?

Choose the number of training days that fits your week. Choose the weight that fits you.

Training frequency can mean the number of days you lift, or how often a particular muscle is trained. Those are different questions. A six-day routine divided into pushing, pulling, and leg sessions can train each area about twice weekly. So can a two-day full-body routine.

When the total weekly work is matched, the number of training days generally matters less for muscle growth than the work itself. Research comparing full-body and split routines has not shown a clear advantage for either arrangement under matched volume. This supports choice, not a claim that scheduling never matters. [S14, A15]

Your week	A reasonable organization
Only a few available days	Full-body sessions that cover the main movement patterns.
More days, shorter windows	Upper/lower or push/pull/legs sessions that divide the work.
Unpredictable shifts	Follow the sessions in order instead of attaching each one permanently to a weekday.

Muscle growth allows flexibility; strength is more specific

Muscle can grow with a range of weights when the sets are challenging enough. Heavier loads generally work better for improving the heaviest weight you can lift in a tested exercise. Much of the research is not specific to every age group or health situation. [S17]

The program mostly uses 6-15 repetitions for larger movements and 10-20 for smaller exercises. A woman using 15-pound dumbbells and a man using 50-pound dumbbells can follow the same repetition range. The intended challenge is relative to the person, not tied to sex.

NO MAXIMUM-STRENGTH TEST REQUIRED

Start with a load you can control and leave a few good repetitions available. Percentages of a one-repetition maximum are only rough guides; different people can complete different numbers of repetitions at the same percentage.

04 / THE RIGHT CHALLENGE

How hard should a set feel?

Hard enough to challenge the muscles. Not so hard that control becomes optional.

Training to failure means you cannot finish another repetition with the intended technique and range. Stopping because you feel joint pain, dizziness, or unusual breathlessness is not the same thing. Those symptoms are not targets to push through.

The research does not show that every set must reach failure to build muscle. Getting reasonably close can matter, but the exact best stopping point remains uncertain. The program balances effort with repeatable technique and manageable fatigue. [S22, A16, A18]

Good repetitions left	Approximate effort score	How to think about it
4	6 out of 10	A useful reserve while learning or on a lighter day.
3	7 out of 10	Challenging, with a clear margin.
2	8 out of 10	Hard, but you estimate two more good reps were possible.
1	9 out of 10	Very hard; a small margin remains.
0	10 out of 10	Failure. Not required by this program.

The technical term is repetitions in reserve, or RIR. The effort-score column is the matching resistance-training RPE scale; it is not a conversion for every scale that uses the word "effort." These are estimates, especially when you are new.

Rest is part of the workout

The program usually allows 2-3 minutes between larger movements and 60-120 seconds for smaller ones. Rest longer when needed to repeat useful work. Short rests are not required for muscle growth, and a strength session does not need to become a breathlessness test. [S15]

YOUR DEFAULT

Leave about 2-3 good repetitions available in most working sets. Use 3-4 while learning or when recovery is lower. Stop earlier whenever the next repetition would require a major change in posture, balance, or range.

RESEARCH IN VIEW / EFFORT

Training hard does not require failure

This figure helps explain the effort question, but it does not identify an exact best stopping point.

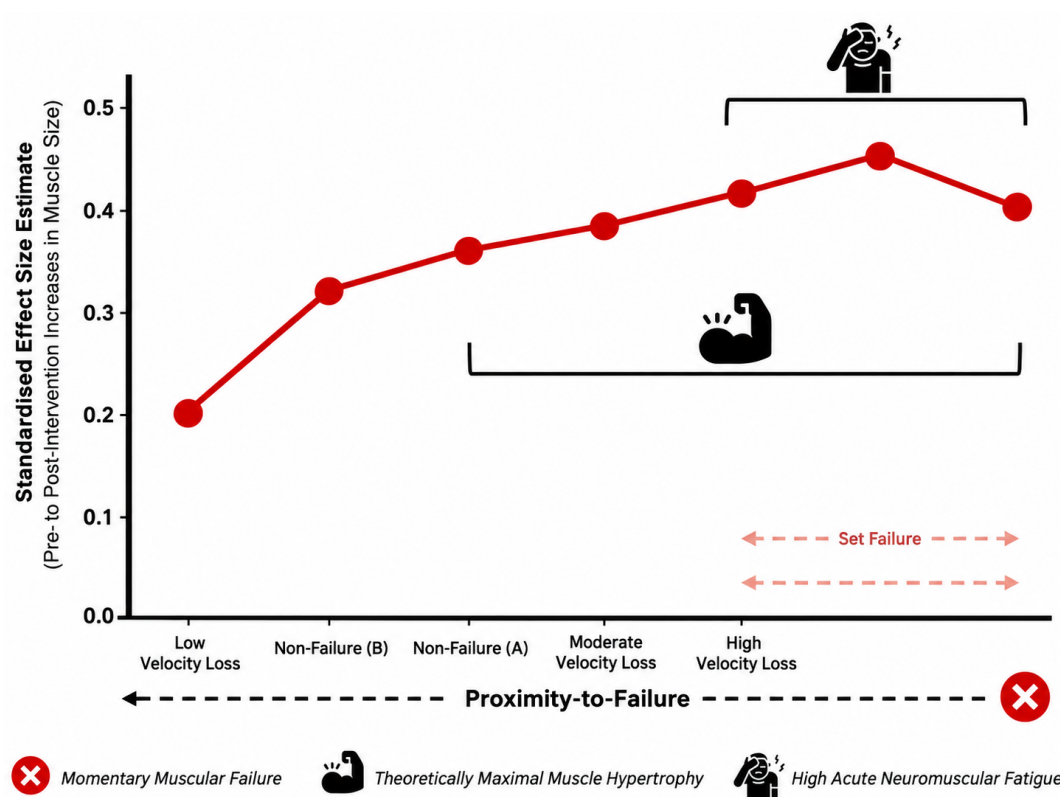


Figure 3. Refalo and colleagues' (2023) reported within-condition pre-to-post muscle-size effect estimates, arranged in a conceptual order from lower velocity loss toward momentary muscular failure. The true proximity achieved in each condition was uncertain, so the curve does not establish an exact best stopping point. [S22]

These estimates should not be read as proof that every failed repetition reduces muscle growth. They do not identify a universal RIR target or directly measure injury or cardiovascular risk.

WHAT TO USE IN PRACTICE

Choose a load and exercise that allow genuine effort while keeping control. Use safety arms, an appropriate machine, or a spotter when being unable to finish a repetition would have serious consequences.

You do not have to test failure to "prove" that a set was productive. The companion program asks for a controlled reserve and a usable record, not an exhausted finish.

How to keep making progress

Progression is a gradual adjustment, not a demand to beat every previous workout.

Progressive overload means the training becomes more demanding as your ability improves. You might add repetitions, a little resistance, a useful set, or a more challenging variation. Extra soreness is not the goal. [S11, A17]

Periodization means organizing changes into planned blocks. It can be useful, especially for specific strength goals, but the reviewed research did not find a clear muscle-growth advantage when total work was matched. You do not need a complicated calendar to begin. [S23]

The program’s simple method: repetitions first, weight second

Session	Three working sets	Next step
1	10 / 9 / 8 at the chosen weight	Keep the weight and the intended reserve.
2	11 / 10 / 9	Build the number of controlled repetitions.
3	12 / 12 / 12	Confirm the top of the range next time.
4	12 / 12 / 12 again	Use the smallest practical increase next time.
5	9 / 9 / 8 at the new weight	Build repetitions again. Do not also add sets.

This is called double progression. The example shows the process, not a promised speed of improvement. The two-session confirmation rule is a conservative coaching choice.

When things stop improving

First check that you are comparing the same exercise and setup. Review consistency, effort, food, sleep, and stress. When those are adequate and recovery is good, a small increase in work for one muscle may help. When recovery is poor, reducing the demand can be the better experiment.

AN EASIER WEEK IS A TOOL

A deload is a temporary reduction in training. Use it when needed; it is not compulsory every fourth week. Keeping the habit with less work can be more useful than forcing the normal dose or abandoning the routine.

How much protein do you need?

Enough to support your goal, without turning a useful target into a rigid rule.

The classic adult Recommended Dietary Allowance (RDA) of 0.8 grams per kilogram per day is a reference for basic needs. A training target asks a different question: what intake may better support adaptation? It is too broad to say that everyone over 40 eating the RDA is protein-deficient. [S28, S29, S66]

Reference or purpose	Protein context
Classic adult RDA	0.8 g/kg/day. A reference intake, not a muscle-building prescription.
Healthy older-adult guidance	Often about 1.0-1.2 g/kg/day, adjusted for activity and health. [S28, S29]
2025-2030 U.S. dietary guidance	A protein serving goal of 1.2-1.6 g/kg/day, adjusted to individual calorie needs. [A1]
Sports-nutrition guidance	1.4-2.0 g/kg/day for most exercising people. [S66]
This program's starting approach	About 1.6 g/kg/day for a generally healthy adult lifting regularly. A feasible 1.2-1.6 range may be a useful first step.

A large training meta-analysis found a modeled point near 1.62 g/kg/day beyond which extra protein did not show further average benefit for fat-free-mass gain. That is not your personal maximum, a toxicity threshold, or a promise that the same number suits every older adult. [S31, S32]

PUT THE NUMBER INTO ORDINARY UNITS

Kilograms = pounds ÷ 2.205. For an 80-kg adult (about 176 lb), 1.6 g/kg is 128 g of protein per day. The program includes more examples and meal-planning worksheets.

Use individual advice when needed. Significant obesity, underweight, fluid retention, and medical conditions can change the appropriate weight to use in the calculation. Kidney disease can also change the target itself. Do not multiply the largest available weight by the highest factor and assume it is better. [A3]

● 07 / MAKING PROTEIN PRACTICAL

Build protein into the meals you eat

A daily target becomes useful when it fits your appetite, schedule, preferences, and food budget.

One practical approach is to include protein at three or four eating occasions. About 0.4 g/kg at a substantial meal is a commonly used planning value for older adults, not an on/off switch. A smaller meal is not wasted. [S10, S35]

THE ARITHMETIC MATTERS

Three meals at 0.4 g/kg provide 1.2 g/kg for the day. Four provide 1.6. With only three meals, use larger protein portions or a protein-containing snack to reach a higher daily target.

You do not need to measure every amino acid

Leucine is one of the amino acids involved in the muscle-building response. The underlying review discusses roughly 2.5-3 grams in a protein-rich meal. This explains part of the biology; it is not a requirement to weigh isolated leucine before eating. Whole protein foods also provide other essential building materials. [S40]

Plant-based and animal-based options

A carefully planned vegan diet supported daily muscle-protein synthesis similarly to an omnivorous diet in a short study of active older adults. That does not prove every vegan eating pattern produces identical long-term muscle growth. Portions, variety, and overall nutrition still matter. Choose tolerated protein-rich foods and use a supplement only when it solves a practical gap. [S45]

Do not let the clock make eating harder

The reviewed timing research did not show an independent benefit once total protein was accounted for. A protein-containing meal within a practical period before or after training is useful. Missing a narrow post-workout deadline does not erase the session. [S47, S48]

Evidence for a perfectly even protein distribution is stronger for short-term metabolic measures than for long-term muscle-size outcomes. A rigid four-meal schedule is not established as best for every person. [S38, S72]

A MANAGEABLE FIRST CHANGE

When breakfast is usually low in protein, improve that meal before adding more rules. Build a pattern you can keep on busy days, not just ideal ones.

08 / CARBOHYDRATE

Carbohydrate intake and muscle growth

Carbohydrate can help you train and eat well. The evidence for extra muscle growth from more carbohydrate alone is less certain.

A review of 11 studies did not find a statistically clear independent muscle-growth benefit from higher carbohydrate intake. The pooled estimate was a standardized mean difference of about 0.15, and its uncertainty interval crossed zero. The certainty was rated low. That is not proof that carbohydrate never matters. [S50]

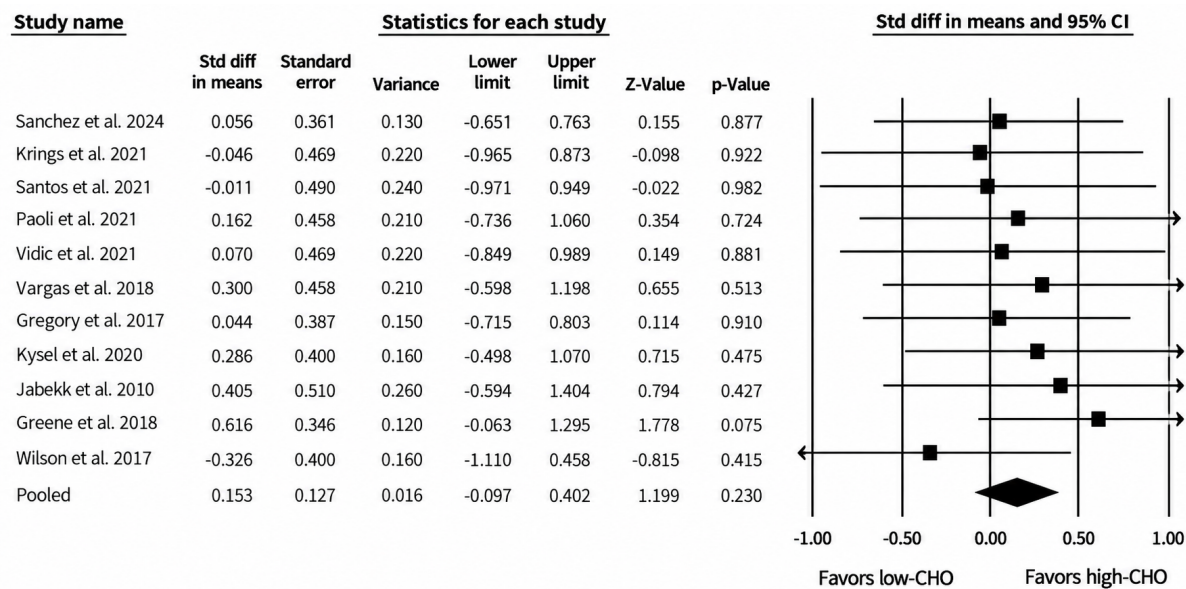


Figure 4. Henselmans and colleagues (2026) reported a pooled standardized mean difference of 0.15 (95% CI -0.10 to 0.40; p = 0.23), so the interval crosses zero and the independent effect was not statistically clear. [S50]

Carbohydrate may help performance during longer sessions, repeated demanding sessions, or training after fasting. Fruit, vegetables, legumes, and whole grains also contribute to the overall diet. A short-term performance benefit is not automatically proof of more long-term muscle growth. [S51, S52]

HOW THE PROGRAM HANDLES IT

Set protein and a reasonable amount of fat, then fit carbohydrate to total food needs, training demands, and preference. The original review's 3-6 g/kg/day is not treated as a minimum for every reader.

Lower-carbohydrate eating can change stored carbohydrate and the water held with it. An early change in measured lean mass is therefore not automatically muscle loss. [S73]

Build an eating pattern, not a ratio

Food quality, enough food, and a routine you can keep matter more than chasing a hormone-friendly percentage.

Fat provides energy and helps make meals satisfying. The program uses about 25-35% of calories as a flexible planning range, not a hormone-protection threshold or a rule everyone must follow. [S58]

The fat-and-hormone research does not tell one simple story. A 2021 review reported lower testosterone with lower-fat diets; a 2025 review did not find a significant difference in the hormones it examined. Neither proves that a specific fat percentage raises testosterone, grows more muscle, or replaces medical care. [S56, S57]

What a sustainable pattern can look like

Part of the meal	Make it work for you
A protein anchor	Use tolerated protein-rich foods at main meals. Plant and animal sources can both fit.
A variety of plants	Include vegetables, fruit, legumes, and whole grains when compatible with allergies and medical needs.
Mostly unsaturated fats	Options include olive oil, nuts, seeds, and fish when tolerated. Choose alternatives when they are not.
Flexible portions	Adjust the amount of food to appetite, training, health, and the current goal.

Mediterranean-style eating is linked with better muscle-related or functional outcomes in much of the reviewed literature. Many findings are observational: people eating this way may also differ in activity and other habits. The pattern is not proof of one perfect carbohydrate-protein-fat split. [S69]

The PREDIMED-Plus trial combined an energy-reduced Mediterranean diet, activity, and behavioral support. Its results cannot isolate one food ratio. A higher percentage of lean mass during weight loss also does not necessarily mean that absolute lean mass increased. [S70]

KEEP THE USEFUL PART

Build meals from foods you tolerate, enjoy, can afford, and can prepare. Use individual dietary guidance for cholesterol, cardiovascular disease, or other medical needs rather than forcing a generic ratio.

● 10 / FOOD ENERGY

Eat enough for the goal you chose

Your muscles need a training signal and the resources to respond to it.

Energy balance compares the calories you eat with all the energy you use. Energy availability is a different sports-science calculation: it subtracts exercise energy from food intake, then divides by fat-free mass. They are related, but one cannot simply replace the other. [A2]

THE RESEARCH FORMULA IS NOT YOUR CALORIE PRESCRIPTION

Energy availability (kcal/kg fat-free mass/day) = (daily food calories - daily exercise calories) ÷ kilograms of fat-free mass.

For example, eating 2,400 calories in a day, using 400 calories during exercise that day, and having 50 kg of fat-free mass gives an estimated energy availability of 40 kcal/kg fat-free mass/day: $(2,400 - 400) \div 50$. It does not tell us whether your total daily energy use is 2,100, 2,400, or 2,800 calories. It cannot establish your maintenance intake.

The earlier draft's "at least 45 kcal/kg fat-free mass for maintenance" is therefore not used as a universal calorie target. Athlete reference values are not maintenance equations for every man and woman, and the measurements used to estimate them contain error. [A2]

Under-fueling deserves attention

Short-term studies have found reduced muscle-protein synthesis during low energy availability, including in trained women. That supports concern about inadequate intake, but does not define a safe threshold for every person. [S64]

A training meta-regression linked a daily deficit around 500 calories with no average lean-mass gain. It did not prove that 501 calories prevents all growth or that 499 guarantees it. Training history, starting body composition, and the real size of the deficit still matter. [S65]

A MORE USEFUL APPROACH

Begin with an intake that has kept your weight fairly stable, or an appropriate professional estimate. Observe appetite, performance, recovery, and the weight trend when relevant for two to three weeks. Make a small change for the chosen goal, then reassess.

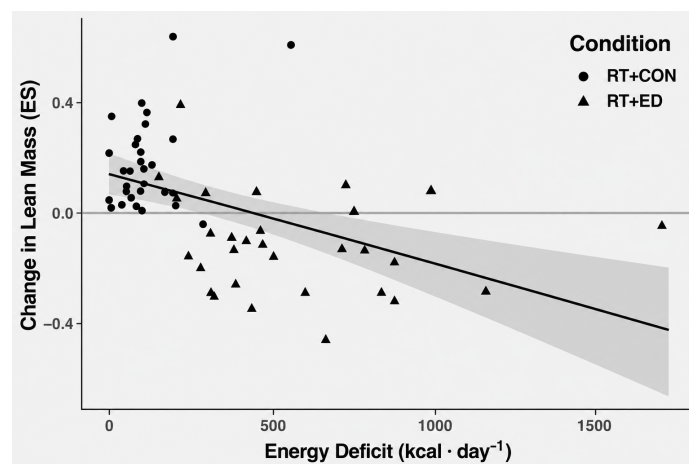


Figure 5. Across 60 group estimates, larger deficits were associated with smaller lean-mass responses. The published model crossed zero near 500 kcal/day - a group average, not an individual cutoff. [S65]

Points: supplementary Tables S1-S2. Solid line and gray band: OLS visual fit (95% CI). Published robust model: $ES = 0.16 - (0.00031 \times \text{deficit})$.

Fat loss without forgetting muscle

The priorities change when you are eating less, especially when appetite is reduced.

Building muscle, maintaining strength, and losing fat are different phases. During intentional weight loss, keeping useful training and maintaining performance can be a meaningful success. The scale alone cannot tell you which tissue changed. [S65, S73]

Recomposition means losing fat while gaining or preserving muscle. It can happen, but this program does not promise it. Use longer-term trends, repeated exercises, everyday function, and optional waist measurements rather than expecting a body-composition device to detect small weekly changes accurately. [S31, S73]

When food is harder to eat

The additional joint advisory on GLP-1 treatment emphasizes adequate nutrition, resistance training, and muscle and bone preservation. It does not validate the exact workouts in the companion program. Medication-related advice is additional context, not part of the original review's full training analysis. [A12]

What is happening	A practical response
Meals feel too large	Use smaller protein-containing meals or snacks and seek dietetic support instead of forcing oversized meals.
Performance keeps dropping	Review food, hydration, symptoms, and training volume before adding more exercise.
Persistent nausea, vomiting, or dizziness	Pause demanding training and contact the treating clinician. Severe symptoms may need urgent care.
Weight falls while strength is stable	Keep watching the whole pattern. Stable strength does not prove zero muscle loss; weight loss is not automatically muscle loss.

Do not start a self-directed calorie deficit when underweight, frail, pregnant, recovering from illness, unintentionally losing weight, or struggling with disordered eating. Those situations need a different nutrition plan.

MEDICATION DECISIONS STAY WITH THE TREATING TEAM

Neither PDF starts, stops, selects, or changes the dose of a GLP-1 medicine, hormone treatment, or any other medication. The training framework does not require them.

● 12 / MAKE IT PERSONAL

Shared principles. Individual needs.

Men and women do not need separate basic rules for getting stronger.

Both can make meaningful strength and muscle gains. Differences between group averages do not tell us the correct starting weight for a particular person. The program does not give men heavy training and women only light "toning" exercises. [A4, A5]

The movement patterns, repetition ranges, and progression method are shared. The load, equipment, exercise version, and amount of work change according to current ability, comfort, preferences, and recovery. No body part is assigned by sex.

Menstrual symptoms

Research does not establish one reliable cycle calendar that tells every woman when to train hard or reduce all training. Adjust for symptoms you actually experience. An app-predicted phase alone is not a reason to cancel a session that feels well tolerated. [A6]

Perimenopause and menopause

Changes in sleep, symptoms, joint tolerance, or life demands may affect how much work feels manageable. Review those changes and adapt the dose instead of assuming meaningful strength training is no longer appropriate. Osteoporosis or a history of fracture calls for individual guidance on loading and movement choices. [A11]

Pregnancy, postpartum recovery, and pelvic-floor symptoms

The generic adult workout cards are not a full prenatal or postnatal plan. Use obstetric guidance and, when appropriate, pelvic-health support. Persistent leakage, heaviness, pelvic pain, recent surgery, or significant symptoms should not simply be trained through. [A7]

ASK THREE QUESTIONS FIRST

What can you do comfortably? What are you working toward? What can you recover from? Those answers are more useful than stereotypes about age or sex.

● 13 / BEYOND THE WORKOUT

The rest of your week still matters

Strength training is important. It is not the whole activity or recovery plan.

Adult public-health guidance includes at least 150 minutes of moderate aerobic activity a week, 75 minutes of vigorous activity, or an equivalent mix. Older adults should also include balance activity. Build toward these goals from your current capacity; they are not an entry test for lifting. [A8, A9]

Keep movement manageable

Walking, cycling, or another preferred activity can fit around strength sessions. Start gradually when inactive. Placing demanding endurance sessions away from hard leg workouts can help manage fatigue; an ordinary walk is not a threat to your muscle gains.

Power is the ability to produce force quickly. The program offers an optional, modest example: stand from a stable chair briskly, then sit down under control. That is not a blanket recommendation for jumping, Olympic lifting, or maximal-speed exercise. [S11]

Protect sleep before adding more work

CDC guidance recommends at least seven hours for adults through age 60, 7-9 hours at ages 61-64, and 7-8 hours for adults 65 and older. Persistent insomnia, pronounced daytime sleepiness, or possible breathing interruptions during sleep deserves assessment, not just more stimulants. [A14]

Supplements stay optional

A protein powder can help close a practical intake gap. Creatine monohydrate is an optional aid for repeated high-intensity efforts; 3-5 grams daily is a commonly used approach, and loading is not essential. Early water-related weight gain can occur. It does not replace training or food. Discuss use when kidney disease, pregnancy, or another relevant concern is present. [A13]

Isolated amino-acid products, "testosterone boosters," or a complicated recovery stack are not required by the program. Choose supplements according to a real need, tolerance, and quality, not a promise of a shortcut. [S66, A13]

THINK IN WEEKS, NOT JUST WORKOUTS

Make room for strength, comfortable aerobic activity, balance where needed, food, and rest. A plan is only useful when you can keep recovering from it.

When to get individual guidance

A general program can make training easier to start. It cannot clear every person for every exercise.

Screening should consider your current activity, symptoms, known cardiovascular, metabolic, or kidney disease, and the intensity you plan to attempt. Being over 40 alone does not mean every healthy person needs extensive testing before light-to-moderate activity. Concerning symptoms still matter in a "beginner" workout. [\[A10\]](#)

STOP AND SEEK HELP

Stop exercise for chest pressure, fainting, severe unexplained breathlessness, or sudden neurological symptoms. Seek urgent assessment; call emergency services when symptoms are severe or ongoing. Stop a movement that causes new sharp pain, swelling, or loss of function rather than repeatedly testing it with more weight.

Situation	What needs to be individualized
Osteoporosis or a fragility fracture	Loading, impact, and spinal movements; supervised instruction may be important. [A11]
Pregnancy or postpartum recovery	Obstetric and, when needed, pelvic-health modifications. [A7]
A condition affecting exercise safety	Starting intensity, restrictions, and monitoring with the treating clinician. [A10]
Recurrent falls or major mobility limitations	Equipment, support, and a supervised plan rather than relying on a printed split. [A9, A11]

Kidney disease changes the protein advice

The sports-oriented protein targets must not override a renal nutrition plan. KDIGO guidance suggests about 0.8 g/kg/day for many adults with chronic kidney disease at stages G3-G5 and advises avoiding more than 1.3 g/kg/day when at risk of progression. Frailty, dialysis, and other circumstances can change the decision. This is context for a clinician, not a self-treatment target. [\[A3\]](#)

The incomplete kidney-safety sentence in the original supplied draft was not reconstructed or used as blanket reassurance. The earlier evidence edition added the specific renal guidance above; it remains separate from healthy-adult training advice.

● 15 / KEEP THIS HANDY

Your one-page reference

Area	Start here	Adjust by
Training days	Choose one 2-6-day schedule.	Available time and how you prefer to divide the work.
Amount of work	Start low; build a useful base. About 6-12 weekly sets for a priority muscle is one practical zone.	Progress, recovery, and a consistent way to count overlapping work.
Repetitions	Mostly 6-15 on larger movements; 10-20 on smaller ones.	A weight you can control; no required maximum test.
Effort	Usually leave 2-3 good repetitions available.	Leave 3-4 while learning or on lower-recovery days.
Protein	Around 1.6 g/kg/day as a lifting-oriented starting target.	Feasibility, health, and the appropriate body-weight basis.
Meals	Three or four useful protein opportunities.	Your schedule, appetite, culture, allergies, and preferences.
Carbohydrate and fat	Fit the full eating pattern to your energy needs; fat is often 25-35% in this program.	Training demands, tolerance, preference, and clinical advice.
Total food	Calibrate to maintenance, gain, or loss.	Observed trends, not an energy-availability formula.
Recovery and function	Include aerobic activity, balance where needed, and enough sleep.	Your present ability, symptoms, and ability to recover.

The ranges are practical applications of the evidence, not a claim that all cited studies tested this exact program.
[S5, S11, S14, S17, S22, S28, S29, S31, S50, S58, S65, S66, A2, A8, A9, A15, A16]

THE DECIDING QUESTION

Are you completing the plan, getting stronger or maintaining useful ability, and recovering well enough to continue? Keep the numbers that help answer that question. Change the ones that do not.

What the research does not promise

These qualifications were made in the earlier evidence edition and are retained here. They explain why the guidance avoids rigid claims.

An easy conclusion to overstate	The more accurate reading
"Every adult over 40 has the same reduced response."	Muscle responses vary with activity, health, and study conditions. No fixed percentage applies to everyone. [S7, S9, S10]
"12 lower-body sets means a 6-12-set limit per muscle."	A lower-body total is not a per-muscle dose. The study categories do not establish an age-based ceiling. [S5]
"Higher-volume programs stop working after 20 weeks."	Differences between study subgroups are not proof that an individual's program stops working at a time limit. [S5]
"Each extra set produces a predictable percentage of growth."	The average slope of a model is not a personal growth calculator. Diminishing returns and uncertainty remain. [S12]
"Two or three training days is the maximum useful choice."	That is one workable option, not a cap. The companion program offers 2-6-day arrangements. [S14, A15]
"The failure comparison proves that training to failure reduces growth."	The pooled comparisons did not show a statistically clear benefit or harm, and actual closeness to failure was often uncertain. Failure is not compulsory; universal harm is not established. [S22, A16, A18]
"2-4 RIR always equals an effort score of 7-8."	On the specific reserve-based scale used here, 4 RIR is about 6/10, 3 is 7/10, and 2 is 8/10.

ALSO NOT PROMISED

The exact 16-week schedule is not proven to prevent injury, treat diagnosed sarcopenia, or guarantee a particular muscle gain. Its exercise choices and adjustment rules are coaching applications.

● RESEARCH NOTES / NUTRITION

Targets are not biological switches

The earlier evidence edition also qualified the following nutrition claims. Those distinctions matter when turning research into everyday advice.

An easy conclusion to overstate	The more accurate reading
"The RDA diagnoses inadequate protein after 40."	Basic adequacy and training optimization are different questions. No universal deficiency diagnosis is implied. [S28, S29, S66]
"The newer U.S. protein number comes only from commentary."	The 1.2-1.6 g/kg/day serving goal was linked to the official 2025-2030 guidance in the evidence edition. [A1]
"Every meal must cross the same threshold."	Meal planning can help, but smaller meals are not ineffective and a rigid distribution pattern has not proved best for long-term muscle outcomes. [S35, S38, S72]
"Higher protein is safe for all kidneys."	The original sentence was incomplete. Healthy-adult training targets do not replace kidney-specific nutrition advice. [A3]
"Carbohydrate showed no clear growth effect, so everyone needs 3-6 g/kg."	The low-certainty result and a proposed intake range are different things. The range is not imposed on everyone. [S50, S51, S52]
"45 kcal/kg fat-free mass is a maintenance-calorie formula."	Energy availability and energy balance are different. That value is not used as a universal prescription. [A2]
"A deficit over 500 calories makes any muscle gain impossible."	The finding is a group-level relationship, not an absolute individual barrier. [S65]
"Mediterranean eating requires one macro ratio."	It describes a food pattern. Combined lifestyle studies do not isolate a single ratio. The original truncated fat-guideline row was not filled in. [S58, S69, S70]

A diet-quality study cited alongside an omega-3 supplement claim in the original draft was not treated as proof of a supplement effect. Missing or mismatched source material has not been turned into a recommendation.

- THE BIGGER PICTURE

What remains uncertain

The foundation is stronger than the fine-tuning.

Strength training can improve muscle and physical function. Adequate protein supports the process. Persistent under-fueling can undermine it. But the evidence does not identify one universally best split, set count, calorie surplus, or meal schedule. [S11, S31, S65]

Many studies last weeks or months rather than years. They use different ways to measure muscle, include people with different training backgrounds, and vary in supervision, food intake, and exercise selection. A result pooled across them deserves careful interpretation, not dismissal or false precision. [S5, S12, S31, S50]

"Over 40" is a very broad group

A study of trained university-age men and a study of adults in their seventies do not fully describe everyone between them. Midlife adults, older women, long-term trainees, and people with several health conditions are not equally represented. The further your circumstances are from study participants, the more important individual feedback becomes. [S72, A5]

The figures are explanations, not instructions

Figure 1 is a conceptual illustration. Figure 2 summarizes a dose-response model. Figures 3 and 4 visualize pooled estimates and their uncertainty. Figure 5 shows a reported group-level energy-deficit meta-regression. These figures should not make any finding look more certain than the underlying research.

Why the program has adjustment rules

The first weeks are a chance to learn your current tolerance as well as begin training. The companion manual specifies exercises, sets, repetitions, rest, and effort, but also tells you how to reduce the work, change a movement, move a session, or choose the next phase. A plan can be clear without pretending it fits every person unchanged.

THE LONG-TERM ANSWER

Neither "train as hard as possible" nor "take it easy because you are older" is the goal. Use progressive work at a manageable dose, support it with adequate nutrition, and keep the routine long enough to learn from it.

● PLAIN-LANGUAGE GLOSSARY

The terms, without the confusion

Hypertrophy

An increase in muscle size.

Resistance training

Exercise in which your muscles work against resistance: weights, machines, bands, or a challenging body-weight movement.

Repetition / rep

One complete movement of an exercise.

Working set

A planned group of challenging repetitions, separate from an easy preparation set.

Volume

The amount of training. Always check whether the number refers to an exercise, a muscle, or the whole body.

Frequency

How often you train, either overall or for a particular muscle.

Compound movement

An exercise involving several joints and muscle groups, such as a squat or press.

RIR / repetitions in reserve

The number of additional good repetitions you estimate you could complete.

RPE / effort score

A rating of how hard the set feels. This guide uses the resistance-training scale matched to RIR.

Progressive overload

Making the training gradually more demanding as ability improves.

Double progression

Build repetitions within a range, then add a little weight and build repetitions again.

Deload

A temporary reduction in training demand.

Anabolic resistance

A smaller muscle-building response to a given nutrition or exercise input.

Muscle protein synthesis

The process of making muscle proteins; a short-term measurement is not the same as long-term muscle growth.

Lean mass / fat-free mass

Body tissue other than fat, including water; it is not a pure measure of muscle.

Maintenance intake

The amount of food energy that keeps body weight broadly stable over time.

● SOURCES / ORIGINAL REVIEW

Research sources

S labels retain the numbering of the original evidence review. The selected references below support the text in this edition.

- S5** Effects of Resistance Training Volume on Physical Function, Lean Body Mass and Lower-Body Muscle Hypertrophy and Strength in Older Adults: A Systematic Review and Network Meta-analysis of 151 Randomised Trials. Radaelli R, Rech A, Molinari T, et al. Sports Medicine (Auckland, N.Z.). 2025;55(1):167-192. doi:10.1007/s40279-024-02123-z. [Source link](#)
- S7** Metabolic changes in aging humans: current evidence and therapeutic strategies. Palmer AK, Jensen MD. The Journal of Clinical Investigation. 2022;132(16):e158451. doi:10.1172/JCI158451. [Source link](#)
- S9** Does the Muscle Protein Synthetic Response to Exercise and Amino Acid-Based Nutrition Diminish With Advancing Age? A Systematic Review. Shad BJ, Thompson JL, Breen L. American Journal of Physiology. Endocrinology and Metabolism. 2016;311(5):E803-E817. doi:10.1152/ajpendo.00213.2016. [Source link](#)
- S10** Protein Requirements for Master Athletes: Just Older Versions of Their Younger Selves. Moore DR. Sports Medicine (Auckland, N.Z.). 2021;51(Suppl 1):13-30. doi:10.1007/s40279-021-01510-0. [Source link](#)
- S11** American College of Sports Medicine Position Stand. Resistance Training Prescription for Muscle Function, Hypertrophy, and Physical Performance in Healthy Adults: An Overview of Reviews. Currier BS, D'Souza AC, Fiatarone Singh MA, et al. Medicine and Science in Sports and Exercise. 2026;58(4):851-872. doi:10.1249/MSS.0000000000003897. [Source link](#)
- S12** The Resistance Training Dose Response: Meta-Regressions Exploring the Effects of Weekly Volume and Frequency on Muscle Hypertrophy and Strength Gains. Pelland JC, Remmert JF, Robinson ZP, Hinson SR, Zourdos MC. Sports Medicine (Auckland, N.Z.). 2026;56(2):481-505. doi:10.1007/s40279-025-02344-w. [Source link](#)
- S13** Manipulating the Resistance Training Volume in Middle-Aged and Older Adults: A Systematic Review with Meta-Analysis of the Effects on Muscle Strength and Size, Muscle Quality, and Functional Capacity. Marques DL, Neiva HP, Marinho DA, Marques MC. Sports Medicine (Auckland, N.Z.). 2023;53(2):503-518. doi:10.1007/s40279-022-01769-x. [Source link](#)

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- S15** American College of Sports Medicine Position Stand. Progression Models in Resistance Training for Healthy Adults. Medicine and Science in Sports and Exercise. 2009;41(3):687-708. doi:10.1249/MSS.0b013e3181915670. [Source link](#)
- S17** Resistance Training Load Effects on Muscle Hypertrophy and Strength Gain: Systematic Review and Network Meta-Analysis. Lopez P, Radaelli R, Taaffe DR, et al. Medicine and Science in Sports and Exercise. 2021;53(6):1206-1216. doi:10.1249/MSS.0000000000002585. [Source link](#)
- S22** Influence of Resistance Training Proximity-to-Failure on Skeletal Muscle Hypertrophy: A Systematic Review with Meta-analysis. Refalo MC, Helms ER, Trexler ET, Hamilton DL, Fyfe JJ. Sports Medicine (Auckland, N.Z.). 2023;53(3):649-665. doi:10.1007/s40279-022-01784-y. [Source link](#)
- S23** Effects of Periodization on Strength and Muscle Hypertrophy in Volume-Equated Resistance Training Programs: A Systematic Review and Meta-analysis. Moesgaard L, Beck MM, Christiansen L, Aagaard P, Lundbye-Jensen J. Sports Medicine (Auckland, N.Z.). 2022;52(7):1647-1666. doi:10.1007/s40279-021-01636-1. [Source link](#)
- S28** Evidence-Based Recommendations for Optimal Dietary Protein Intake in Older People: A Position Paper From the PROT-AGE Study Group. Bauer J, Biolo G, Cederholm T, et al. Journal of the American Medical Directors Association. 2013;14(8):542-59. doi:10.1016/j.jamda.2013.05.021. [Source link](#)
- S29** Protein Intake and Exercise for Optimal Muscle Function With Aging: Recommendations From the ESPEN Expert Group. Deutz NE, Bauer JM, Barazzoni R, et al. Clinical Nutrition (Edinburgh, Scotland). 2014;33(6):929-36. doi:10.1016/j.clnu.2014.04.007. [Source link](#)

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- S31** A Systematic Review, Meta-Analysis and Meta-Regression of the Effect of Protein Supplementation on Resistance Training-Induced Gains in Muscle Mass and Strength in Healthy Adults. Morton RW, Murphy KT, McKellar SR, et al. British Journal of Sports Medicine. 2018;52(6):376-384. doi:10.1136/bjsports-2017-097608. [Source link](#)
- S32** Systematic review and meta-analysis of protein intake to support muscle mass and function in healthy adults. Nunes EA, Colenso-Semple L, McKellar SR, et al. Journal of Cachexia, Sarcopenia and Muscle. 2022;13(2):795-810. doi:10.1002/jcsm.12922. [Source link](#)
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- S38** Even or Skewed Dietary Protein Distribution Is Reflected in the Whole-Body Protein Net-Balance in Healthy Older Adults: A Randomized Controlled Trial. Agergaard J, Justesen TEH, Jespersen SE, et al. Clinical Nutrition (Edinburgh, Scotland). 2023;42(6):899-908. doi:10.1016/j.clnu.2023.04.004. [Source link](#)
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- S45** A Well-Balanced Vegan Diet Does Not Compromise Daily Mixed Muscle Protein Synthesis Rates When Compared With an Omnivorous Diet in Active Older Adults: A Randomized Controlled Cross-Over Trial. Domić J, Pinckaers PJ, Grootswagers P, et al. The Journal of Nutrition. 2025;155(4):1141-1150. doi:10.1016/j.tjnut.2024.12.019. [Source link](#)
- S47** The Role of Protein Intake and Its Timing on Body Composition and Muscle Function in Healthy Adults: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Wirth J, Hillesheim E, Brennan L. The Journal of Nutrition. 2020;150(6):1443-1460. doi:10.1093/jn/nxaa049. [Source link](#)

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- S48 Protein Interventions Augment the Effect of Resistance Exercise on Appendicular Lean Mass and Handgrip Strength in Older Adults: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Kirwan RP, Mazidi M, Rodríguez García C, et al. The American Journal of Clinical Nutrition. 2022;115(3):897-913. doi:10.1093/ajcn/nqab355. [Source link](#)
- S50 The Effect of Carbohydrate Intake on Muscle Hypertrophy: A Systematic Review and Meta-analysis. Henselmans M, Vårvik FT, Izquierdo M. Sports Medicine (Auckland, N.Z.). 2026;56(3):691-702. doi:10.1007/s40279-025-02341-z. [Source link](#)
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- S52 The Ergogenic Effects of Acute Carbohydrate Feeding on Resistance Exercise Performance: A Systematic Review and Meta-analysis. King A, Helms E, Zinn C, Jukic I. Sports Medicine (Auckland, N.Z.). 2022;52(11):2691-2712. doi:10.1007/s40279-022-01716-w. [Source link](#)
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- S57 The Effect of Low-Fat Diets Versus High-Fat Diet on Sex Hormones: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Soltani S, Hejazi M, Meshkini F, et al. Journal of Food Science. 2025;90(5):e70266. doi:10.1111/1750-3841.70266. [Source link](#)
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- S64 Low Energy Availability Reduces Myofibrillar and Sarcoplasmic Muscle Protein Synthesis in Trained Females. Oxfeldt M, Phillips SM, Andersen OE, et al. *The Journal of Physiology*. 2023;601(16):3481-3497. doi:10.1113/JP284967. [Source link](#)
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- S70 An Energy-Reduced Mediterranean Diet, Physical Activity, and Body Composition: An Interim Subgroup Analysis of the PREDIMED-Plus Randomized Clinical Trial. Konieczna J, Ruiz-Canela M, Galmes-Panades AM, et al. *JAMA Network Open*. 2023;6(10):e2337994. doi:10.1001/jamanetworkopen.2023.37994. [Source link](#)
- S72 The role of nutrition in the prevention of sarcopenia. Robinson S, Granic A, Cruz-Jentoft AJ, Sayer AA. *The American Journal of Clinical Nutrition*. 2023;118(5):852-864. doi:10.1016/j.ajcnut.2023.08.015. [Source link](#)
- S73 International Society of Sports Nutrition Position Stand: Diets and Body Composition. Aragon AA, Schoenfeld BJ, Wildman R, et al. *Journal of the International Society of Sports Nutrition*. 2017;14:16. doi:10.1186/s12970-017-0174-y. [Source link](#)

● SOURCES / ADDITIONAL CONTEXT

Additional guidance

A labels identify studies and official guidance added to the original review, including safety and adaptations for different needs.

- A1 U.S. Departments of Health and Human Services and Agriculture. Dietary Guidelines for Americans, 2025-2030. 2026. Protein serving goal, p. 2. [Source link](#)
- A2 Mountjoy M, Ackerman KE, Bailey DM, et al. 2023 IOC consensus statement on Relative Energy Deficiency in Sport (REDs). British Journal of Sports Medicine. 2023;57:1073-1097. doi:10.1136/bjsports-2023-106994. [Source link](#)
- A3 KDIGO. 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney International. 2024;105(Suppl 4S):S117-S314. Protein recommendations 3.3.1. [Source link](#)
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- A5 Refalo MC, et al. Sex differences in absolute and relative changes in muscle size following resistance training: a systematic review with Bayesian meta-analysis. 2025. PMID:40028215. [Source link](#)
- A6 McNulty KL, Elliott-Sale KJ, Dolan E, et al. The Effects of Menstrual Cycle Phase on Exercise Performance in Eumenorrheic Women: A Systematic Review and Meta-Analysis. Sports Medicine. 2020;50:1813-1827. doi:10.1007/s40279-020-01319-3. [Source link](#)

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- A8 Centers for Disease Control and Prevention. Adult Activity: An Overview. Physical Activity Basics. Official guidance, accessed 8 October 2026. [Source link](#)
- A9 Centers for Disease Control and Prevention. Older Adult Activity: An Overview. Physical Activity Basics. Official guidance, accessed 8 October 2026. [Source link](#)
- A10 Riebe D, Franklin BA, Thompson PD, et al. Updating ACSM's Recommendations for Exercise Preparticipation Health Screening. *Medicine & Science in Sports & Exercise*. 2015;47:2473-2479. doi:10.1249/MSS.0000000000000664. [Source link](#)
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- A14 Centers for Disease Control and Prevention. About Sleep. Accessed 8 October 2026. [Source link](#)
- A15 Ramos-Campo DJ, et al. Efficacy of Split Versus Full-Body Resistance Training on Strength and Muscle Growth: A Systematic Review With Meta-Analysis. *Journal of Strength and Conditioning Research*. 2024. PMID:38595233. [Source link](#)
- A16 Robinson ZP, Pelland JC, Remmert JF, et al. Exploring the Dose-Response Relationship Between Estimated Resistance Training Proximity to Failure, Strength Gain, and Muscle Hypertrophy: A Series of Meta-Regressions. *Sports Medicine*. 2024;54:2209-2231. doi:10.1007/s40279-024-02069-2. [Source link](#)
- A17 Chaves TS, et al. Effects of Resistance Training Overload Progression Protocols on Strength and Muscle Mass. *International Journal of Sports Medicine*. 2024;45(7):504-510. doi:10.1055/a-2256-5857. [Source link](#)
- A18 Refalo MC, et al. Similar muscle hypertrophy following eight weeks of resistance training to momentary muscular failure or with repetitions-in-reserve. 2024. PMID:38393985. [Source link](#)

HEALTH, SAFETY, AND RESPONSIBILITY

This guide provides general education about strength training and nutrition. It is not personalized medical care, diagnosis, treatment, rehabilitation, or a substitute for advice from a qualified professional. If you have a medical condition or injury, are pregnant or postpartum, take medication, or are unsure whether these recommendations suit you, speak with a qualified healthcare professional before making changes.

Start gradually, use proper technique, and choose exercises and loads appropriate for your ability. Exercise and dietary changes carry risk, and individual results vary. Stop if you experience pain, dizziness, or unusual shortness of breath, and seek medical advice. Get urgent help for chest pain or other serious symptoms. Check with a healthcare professional before using supplements because they can interact with medicines. You are responsible for deciding whether and how to use this information in light of your circumstances.