Independent Research & further reading

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Relationship between mental and physical health

> *“mental health is directly related to people's physical health. If you feel, if you look better and feel better about yourself, your mental health improves too.”*

The relationship between mental and physical health is complex and multifaceted, involving direct physiological connections and indirect influences through lifestyle and social factors.

References 1-3.

Engaging in difficult tasks: anterior mid-cingulate cortex (aMCC)

> *“Andrew Huberman told me this. He said that they've, neuroscience has found a part of the brain which is associated with doing hard things. I think he said basically that that part of the brain, and I'll put this up on the screen, grows the more hard things that you do. Mm-hmm. So you basically build the muscle of being able to do hard things. (...) Andrew Huberman was talking about was that if you start to like the thing that you actually didn't like in the beginning, then it no longer challenges that area of the brain. That area of the brain starts to shrink again.”.*

The anterior mid-cingulate cortex (aMCC) becomes highly active during difficult or demanding tasks, playing a key role in integrating negative emotions, pain, and cognitive control to support persistence and goal-directed behaviour. However, current research offers no clear evidence that task engagement alone induces structural changes in this brain region. Most studies to date have focused on functional activation and connectivity, rather than anatomical alterations.

Cognitive challenges are linked to increased blood flow and neural activity in the aMCC, underscoring its central role in processing the effort-related dimensions of thought and decision-making. The aMCC is also particularly responsive to the interaction between threat and reward. For instance, studies have reported elevated activity in this region when participants encountered both pleasant and threatening stimuli. These findings suggest that the aMCC helps integrate emotional information under pressure, supporting adaptive decision-making during complex tasks.

Lesion and inhibition studies further reinforce the importance of the anterior cingulate cortex (ACC) as a whole: disrupting its function impairs the ability to initiate, sustain, and accurately perform cognitive tasks, emphasising its critical role in cognitive control and task engagement.

References 4-15.

Abdominal fat: nutrition *vs* exercise

> *"your abs are gonna be impacted most by your nutrition."*

> *"Some people think doing sit-ups is the way to get rid of that stubborn belly fat. What is the answer in your view? It's, it's the level of the level of strictness of nutrition. And I mean the level of strictness. It's not just in the foods that you choose, but the consistency with which you choose them. So how long can you sustain this really clean diet? And I hate the word clean diet. 'cause usually when people say they eat clean, it's actually the first thing. It's a red flag that they don't."*

Calorie-restricted diets alone lead to significant reductions in both subcutaneous and visceral (intra-abdominal) fat, which are the main contributors to abdominal fat. Adding exercise to a calorie-restricted diet can further enhance subcutaneous fat loss, but the additional reduction in visceral fat is often small or not statistically significant.

References 16-21.

Physical appearance among CEOs

> *"But he said that the beauty dividend basically says that people that have that confidence that are perceived to be in better shape have an 8% higher earning potential every year of their life. But it, he also said something else to me, which punched me in the face, which is that of the, like Fortune 500 CEOs, 25% of them are in one classification, like aesthetically beautiful. So it could be height, for example. Mm-hmm. Whereas the general public, only 2% of them are above six one. But in the Fortune 500, 25% of them are.*

In a large study from China, individuals who exercised regularly earned 3.79% more than those who did not, and for those who started exercising, income increased by 13.36% compared to non-exercisers.

CEOs who are perceived as more competent or attractive tend to receive higher salaries and total compensation compared to their less attractive or less competent-looking peers. A study showed that in the banking sector, CEOs with above-average facial attractiveness earned up to 17% more in total compensation than those with below-average looks, even after accounting for other factors. Both facial attractiveness and facial maturity (such as having a "baby face") can impact CEO pay, with some evidence suggesting that these effects may vary by race and cultural context. Despite the pay premium, there is no evidence that CEOs who look more competent or attractive actually deliver better firm performance.

In his book Blink, Malcolm Gladwell noted that around 58% of Fortune 500 CEOs are over 6 feet tall, and 30% stand at 6 feet 2 inches or taller—a height reached by only 3.9% of adult men in the U.S. population.

References 22-27.

Dietary fats, sugar and protein

"So by dietary fat is not the cause for concern that it once was, back in the eighties and nineties, everybody was supposed to stay away from fat. And I, I definitely was a product of that. I read too much about that growing up. I was fearful of dietary fat. I stayed away from it. I definitely had some health issues because of that. Um, but because it's, ***there are nine calories per gram of fat versus four calories per gram of protein or carbohydrate****. There are much more calorie dense foods. So when you have fats on your plate in any way, shape or form, calorically, that dish is going to increase pretty quickly. So you have to be mindful of them. If you, if you want to lose weight and achieve a hypo caloric state to get there, you're gonna have to take in fewer calories than your, than your, than you're burning. That's why I would look at fat content.*

But ***sugar is just really not necessary.*** *It's just one of those, um, things that our bodies do not need and, um, tends to be, uh, too inviting to the point where people have a hard time stopping eating sugar. So I think that's one of the fastest ways to, um, to get yourself on track is to, is to try to minimize the sugar content and the food, and again, have a respect for the contribution of fats because the calor calories themselves will grow, will grow.*

And then I look for protein, because I think that ***protein has a lot of benefits in terms of improving that ratio of fat to lean muscle, and also for its ability to satiate you****. So if you're eating a higher protein food, you're likely going to find yourself feeling satisfied and full faster than if it's just a carbohydrate based meal"*

<u>Dietary fats</u>

Fats provide approximately 9 calories per gram, which is more than double the energy provided by proteins or carbohydrates (each supplying about 4 calories per gram). The metabolic utilisation of dietary fats is influenced by factors such as fatty acid composition, size, isomeric configuration, degree of unsaturation, and esterified position on the glycerol molecule. These qualitative factors, in addition to quantity consumed, may regulate caloric balance.

Dietary sugar

While the body requires carbohydrates for energy, it can obtain all necessary glucose from complex carbohydrates and does not need dietary sugar (such as table sugar or added sugars) for normal functioning. There is no physiological requirement for dietary sugar, and reducing its intake is generally recommended for better health.

Protein

Supplementing with protein, particularly during resistance training, leads to increased lean mass and reduced fat mass in healthy and younger individuals. These effects are more pronounced with longer training durations and higher protein intake. A randomised trial showed higher protein diets (e.g., 2.4 g/kg/day) during calorie restriction result in greater gains in lean body mass and more fat loss compared to lower protein diets, even when both groups exercise intensely.

References 28-42.

How many hours are people sleeping?

> *"Even in cases of lower sleep totals, um, there's actually 27% of people report sleeping, uh, less than six hours a night, and 20% of people sleep four to five hours."*

The percentage of US adults sleeping six hours or less per night has risen from 22.3% in 1985 to about 29.2% in 2012, with little change since then. National surveys from 2020 indicate that 33.2% of adults report sleeping less than seven hours per night. A large-scale meta-analysis published in 2021 found that one in four people slept less than age-specific recommendations, with 6.5% of adults sleeping less than 6 hours per night.

Note: No sources were found stating that 20% of people sleep four to five hours.

References 43-46.

Short sleeper syndrome

“There are two genes that are actually responsible for, uh, short sleep or syndrome. In other words, where you can get away with less sleep because it, it optimizes, um, gene expression for wakefulness. And brainstorm activity that allows you to wake up easier, uh, and feel more. Uh, recuperated and energized. And the downside to that is that only one to 3% of the population has that. So unless I got really lucky in terms of that, then I might be, you know, playing a game that I ultimately can't win. Mm-hmm. Um, but I think that there is a possibility that some people can't operate better on lower sleep totals than others.”

Short sleeper syndrome refers to individuals who naturally require less sleep than average, often 4–6.5 hours per night, without negative health effects. Research has identified several genetic mutations associated with this trait, providing insight into the biological mechanisms that regulate sleep duration. The identified genes are involved in diverse pathways, including circadian rhythm regulation (DEC2), neurotransmitter signaling (NPSR1, mGluR1, NR3A), and stress response.

Natural short sleeper syndrome is rare, and the prevalence of these specific gene mutations in the general population is very low. Most studies are limited to small numbers of affected families or individuals, and large-scale population data are lacking.

References 47-52.

Anabolic steroids and growth hormone: abdominal enlargement

“You know, sometimes you see, um, older bodybuilders, like former bodybuilders and they kind of look a bit bloated. Mm-hmm. What is that? And that's usually anabolic steroid use that causes that or growth hormone. Um, that doesn't generally come from natural occurrences where your, where your belly gets so bloated like that. I mean, sometimes if you have, um, different types of hernias, you can get hernias actually within the abdomen, not just in the inguinal, um, you know, in the groin area. That could cause some of that distension in the ab but not that global bloating that you get there. That's really usually a tell time, a telltale sign of like growth hormone use, something that they've, that they've abused that causes the, the organs underneath to actually grow and cause distension pushing out of the belly.”

Anabolic steroid use and growth hormone administration have been linked to a condition known as Palumboism, or "steroid gut", which is characterised by significant abdominal enlargement and distension in bodybuilders and athletes. Despite its recognition in the bodybuilding community, the scientific understanding of Palumboism remains limited due to a lack of dedicated research.

Reference 53.

Testosterone levels after cessation of TRT

> *"there's a lot of cases where people have extremely bottom out testosterone levels and there's nothing medically that can be done other than the testosterone that's not being made. I completely appreciate that. But as you've noted, the rise in interest in TRT is coming from a lot of the documentation of people talking about their use of it and, and how, you know, they, it's, it's physically changing them and they're doing it at a, at a rate. Like it's, it's becoming option one. Like what about maximizing your natural potential first, you know, before declaring yourself as low testosterone, even at levels like of 400 and 500 and then going and using testosterone, like you're gonna be on that for the rest of your life if you pursue that path, you know, once you decide to replace your body's own natural testosterone level with exogenous testosterone, you're gonna have to rely on that for the rest of your life. Now some people can get off of that and then try to restore their body's ability to produce testosterone, but that's not a given. So be prepared that once you go down that path, it's when you're gonna have to be on for the rest of your life."*

After stopping testosterone replacement therapy (TRT), some men maintain normal testosterone levels and symptom relief, while others do not. Longer TRT duration and higher peak testosterone during treatment increase the likelihood of maintaining normal levels after cessation. Regular exercise is also a strong predictor of sustained response.

References 54-56.

Resistance training and reduction of body fat

> *“you will lose some body fat by simply building more muscle. Okay. Because you'll metabolically become more active so you'll be able to lose some of that body fat.”*

Resistance training consistently reduces body fat percentage, fat mass, and visceral fat in healthy adults, even without additional aerobic exercise or dietary changes. On average, studies show a reduction in body fat percentage by about 1.5% and fat mass by about 0.55 kg compared to no exercise. However, combining resistance training with aerobic exercise and higher protein intake can help preserve or increase muscle mass while promoting fat loss.

References 57-62.

Strength training to combat age-related muscle mass decline

> *“So hypertrophy and strength building is gonna be really important because we are gonna, again, like I talked about before, you're going to naturally lose strength every passing decade. You know, up to eight to 10% per decade as you, as you pass the age of 50. So you need to make sure that you are doing something to stave that off. You can dramatically slow that down by engaging in strength training and engaging in regular weight training with the purpose of trying to build muscle. But you, you have to do that, the brain ages. So having challenges to your balance, having challenges to your ability to, um, maintain muscle recruitment. 'cause that's, again, neurologically, your brain, your neurons start to fire at a slower pace. You need to train these things. Reactivity reaction, you know, reaction skills.”*

With advancing age, skeletal muscles undergo structural and functional changes, resulting in a progressive decline in strength, coordination, and muscle mass. After the age of 50, muscle strength typically diminishes by approximately 1.5% per year between the ages of 50 and 60, increasing to about 3% per year thereafter. This deterioration is attributed to a combination of factors, including the loss of muscle mass, reduced muscle quality, hormonal alterations, and decreased physical activity levels. Nevertheless, evidence suggests that interventions such as regular exercise and appropriate nutritional support can significantly mitigate the rate of decline.

References 63-66.

Increased risk of falling in elderly people

> *"the fall risk uh, increases, uh, exponentially as you get older. Um, a lot of it has to do with something we'll talk about, um, with the thoracic spine and losing mobility there."*

Elderly individuals have an increased risk of falling due to a combination of muscle weakness, joint stiffness, neurological changes, and sensory decline that naturally occur with aging. Impaired gait and balance are major contributors, often worsened by conditions like arthritis, diabetes, and the side effects of medications. Stiffness in the thoracic spine further disrupts posture and natural body movement, shifting the centre of gravity forward and reducing stability during walking. Additionally, slower reflexes, poor vision or hearing, chronic diseases, and fear of falling all compound the risk, making it more difficult for older adults to maintain balance and recover from minor stumbles.

References 67-70.

Maintaining strength is most effective in maintaining muscle mass and performance

> *"there's a pyramid, right? If you look at the, the, the old nutrition pyramid, there's a bottom, which is supposed to be represent the, the, like, all the things you're supposed to work on. And then it kind of fine tunes and works its way up at the bottom of the pyramid, most would say is strength, right? You gotta, you gotta maintain your strength. And then above that you gotta maintain your, your muscle mass, like the amount of lean muscle you carry. And above that you're. Ability to perform because of those two attributes."*

. Muscle mass, motor unit function, and mitochondrial concentration all decline with age, especially in sedentary individuals. Resistance training is the most effective method to increase muscle mass, neural coordination, and strength, while endurance training helps maintain mitochondrial concentration, though with limited impact in very frail individuals. Strength training is

seen as a promising strategy to reverse age-related muscle loss and improve functional ability and health in the elderly.

References 71-73.

Longevity: flexibility and mobility

> *"So the real root of longevity and fitness is really in your ability to maintain mobility, flexibility and stability. Flexibility is the muscle length and in the, and the ability to change the length of the muscle. Mobility is the joint excursions, the ability to move your joints in, in, in, um, their full range of motion."*

While mobility is strongly linked to better quality of life and longevity in older adults, the role of flexibility in health and lifespan remains unclear and debated. Flexibility, defined as the range of motion (ROM) in joints and connective tissues, can be improved through stretching programmes, but evidence suggests that gains in flexibility do not always translate to improved functional ability or longer lifespan. Research in this area is limited by inconsistent study designs, varied testing methods, and a lack of large-scale studies. Although flexibility alone may not directly impact health, maintaining ROM remains important for older adults to support daily activities and overall quality of life. Effective programmes should not only improve flexibility but also focus on reinforcing functional movement patterns.

References 74-78.

How to improve flexibility and mobility

> *"How much work have I got to put in to become more flexible and to improve my mobility? Not, not much. It just has to be consistent. So I mean, I think if you were to devote even five to 10 minutes a day of stretching the areas that are tight, and again, this is very individual, like one thing that I always stressed, even when I was in baseball, every player from me got an individual program and it was based off of a comprehensive assessment."*

Static stretching is a widely used method to improve flexibility, but there is no clear consensus on the optimal stretching parameters, such as intensity, frequency, or duration. Research suggests that while stretching once per week can maintain flexibility gains, stretching three to five times per week leads to further improvements. While static stretching benefits flexibility in adults, some studies observe no additional gains beyond 4 minutes per session or 10 minutes per week. Factors like age, sex, training status, and stretching intensity do not significantly affect flexibility improvements, but greater gains tend to be observed in individuals with lower initial flexibility. Other evidence shows that longer daily stretching durations, such as 60 minutes per day, can produce significantly greater increases in flexibility, particularly when measured with more precise tools like goniometers, even if simpler functional tests do not always capture these differences.

References 79-82.

Maximise your longevity: are there key exercises?

> *"You, you say that there are five key exercises you need to be able to maximize your longevity and quality of life that kind of dovetail into this. The single leg Romanian, deadlift the squat and reach the sumo stance. Hold the posterior chain pushup and hip abductions."*

The optimal type and amount of exercise for maximising cardiovascular health and longevity are not definitively known. However, strong evidence shows that higher cardiorespiratory fitness is linked to lower all-cause mortality, while being unfit is a major risk factor for early death. Strength training is also associated with reduced mortality and cardiovascular disease, with the best outcomes seen around 60 minutes per week. Physical play, aerobic exercise, strength training, flexibility, balance exercises, and mind-body practices like yoga or tai chi all contribute to improved life expectancy and quality of life. While exercises like single-leg Romanian deadlifts can build stability, strength, and power, there is no direct evidence linking them specifically to increased longevity.

References 83-85.

Exercising in all body planes is crucial for complete strength building

“if you look at most leg exercises, the squat, the deadlift, they're occurring in the sagittal plane, which is this front to back plane. One of my favorite exercises of all time is the lunge, right? So I love the exercise, but it's still occurring front to back in this plane here, getting exercises that work the other two planes, and mostly through rotation. But working this frontal plane, this side to side, is really important to producing a complete person, right, with complete levels of strength. And because they're not the primary exercises that do that, like that sideline hip raise, that that we, that I, I showed you is not one of the big exercises that are most important that are gonna be up on your list. You're gonna do your squats first, and you're gonna maybe not never do those, but it doesn't mean that that muscle didn't matter, right? Those muscles are there for a reason and they need to be developed. I, I remember so many times taking some of the most powerful baseball players, the leading home run hitters, and then testing their hip, internal or external str uh, rotation strength, and it being incredibly weak.”

While traditional leg exercises like squats and deadlifts are essential for strength development, they primarily train movement in the sagittal plane (forward and backward). Daily activities, however, rely heavily on multi-planar strength, particularly in the frontal plane (side-to-side motion) and transverse plane (rotational motion). Tasks as simple as rising from a chair require side-to-side stability and control, highlighting the importance of frontal plane strength. Research shows that sagittal-focused training can lead to strong performance gains, but the relative neglect of frontal and transverse plane exercises in many fitness programmes may contribute to muscular imbalances and a higher risk of injury. Incorporating exercises like side lunges, lateral step-ups, and rotational movements helps build balanced strength across all planes, improving overall functional fitness and resilience. A well-rounded exercise programme that addresses all three planes of motion is key to enhancing performance, reducing injury risk, and better preparing the body for the demands of everyday life and sports.

References 86-89.

Thoracic spine: the key for rotational movement

“the spine, see for me, again, I focus a lot on the ability to function in space. And rotation is probably the area of biggest deficit. It's what we lose the most. And the reason for that is because. The area of the spine that's most responsible for functional rotation of the torso is gonna be here in the thoracic spine. So what that is, is anybody that wants to measure on themselves, it's right at the bottom of the, of the neck. So at the base of the neck, the height of the shoulders, and it runs down just to below the rib cage. So right where the rib cage ends is where the thoracic spine ends. It has so many far reaching implications because it shares its range of motion between two different directions. So its ability to go front to back again. He can bend forward and back. We can slump forward, we can go back, right? You wanna have, ideally about 40 degrees of flexion in that area and about 25 degrees of extension through that area”

The thoracic spine is the main driver of functional torso rotation, allowing about 45–50 degrees of movement to each side without hip or knee shifting. Limited rotation or compensation from the lower body suggests restricted thoracic mobility. The thoracic spine naturally has greater range of motion in rotation and side-bending, but ageing (through increased kyphosis) and obesity can reduce this range. Additionally, the way the thoracic spine flexes changes with age, shifting from a delayed, sequential pattern in youth to a more simultaneous motion in older adults.

References 90-92.

Rotation, rotation, rotation

“So maintaining thoracic extension maintains your ability to rotate. The ability to rotate in space is one of the most important functional requirements we have. When you're, when you're falling, as you get older, you're likely reaching spontaneously to grab something, to regain control before you crash down and maybe break a hip. Mm-hmm. Functionally, as an athlete, your ability to perform is all about rotation. You know, you don't usually just move in one plane like this if you're a football player, American or not. You're rotating all the time. You generate force as a soccer player, you know, by kicking across your body. Mmhmm. Right. By throwing a baseball, it's all about rotation. You need to hold onto rotation, but what, what we lose is the ability to extend at our spine. By the age of between 50 and 60 people will have lost 25 to 35% of their ability. Their mobility in this area. You see it. That's horrible. You see it as well”

The ability to rotate the body in space is one of the most important functional requirements for both daily life and athletic performance. Functional movements such as walking, running, reaching, throwing, twisting to grab an object, or even getting out of a car often involve rotational motion rather than simple linear movement. Balance and stability are also heavily dependent on rotational control, particularly when shifting weight, changing direction, or reacting to a loss of balance. In sports, nearly every discipline relies on powerful and controlled rotation, whether swinging a bat, kicking a ball, or pivoting during play. Additionally, for older adults, the ability to quickly rotate and stabilize the trunk is critical in preventing falls and maintaining independence. Scientific research underscores the fundamental role of trunk rotation in human motion patterns, particularly in activities like walking and running. Trunk stabilization exercises have been shown to improve balance and enhance the activation of core muscles such as the transversus abdominis and internal oblique. Furthermore, targeted trunk control training has been found to significantly reduce fall risk by improving the body’s ability to manage rotational movement during everyday activities.

References 93-95.

Thoracic spine exercises to maintain mobility

> *"So the more that you work on maintaining your ability to extend through the thoracic spine, then you don't like develop those downstream adaptations that happen from always being there. So what happens once you get in this position? You lose, um, flexibility through other joints again, if you get, get in that position again."*

Exercising the thoracic spine can play a crucial role in improving spinal alignment, increasing mobility, and decreasing functional disability, thereby helping to prevent or reduce stiffening and maintaining mobility in the elderly. As people age, the thoracic spine naturally tends to lose flexibility, leading to postural issues, reduced rotation, and difficulties with balance and daily activities. Targeted exercises that promote thoracic extension, rotation, and overall mobility can help counteract these changes, preserving an upright posture and improving functional movement. Research shows that regular thoracic mobility training can slow or even partially reverse age-related stiffness, enhancing breathing, balance, and quality of life.

References 96-98.

Posture and lung capacity

> *"Get the low back, the lumbar spine is supposed to be a stable area of your body. (…) If you are in this compressed position where you're rounded forward, hunched over. You actually don't even get good lung inflation. It's like trying to inflate a balloon inside of a box that won't open. You can't get the lungs to inflate properly, lack of properly in, um, uh, uh, operating lungs are gonna cause you to be more fatigued throughout the day. And it cause you to feel, uh, less rested at night. So these, these, this area has so many up, up and down, uh, ramifications that you need to really focus on it."*

Poor posture, particularly a hunched or slumped position, significantly impairs lung inflation by compressing the chest cavity and reducing the space available for full lung expansion. This leads to shallow breathing, lower oxygen intake, and faster onset of fatigue during physical activity, ultimately decreasing endurance and overall activity levels. Maintaining good thoracic spine mobility and upright posture is crucial not only for musculoskeletal health but also for optimal respiratory

function. The respiratory muscles play a complex role in keeping the airways open during wakefulness and sleep, with their effectiveness influenced by posture. Research shows that slumped sitting decreases lung capacity and lumbar lordosis, while upright postures that restore natural spinal curves promote better breathing mechanics. Additionally, positioning strategies such as the prone position have been found to improve respiratory function without causing mechanical strain.

References 99-103.

Suggested frequency and duration of exercise

> *"the nice thing about these drills is they don't have to be done for more than a few weeks consistently to actually start to see the benefits and to feel what happens when you start to become less restricted here."*

While specific guidelines are lacking, overall evidence suggests that exercise intensity is the critical factor for maintaining physical performance over time, even with reduced training frequency and volume. To improve strength, function, and performance, studies recommend performing rotational and strength exercises 2–4 times per week for 6–12 weeks, with sessions lasting 45–60 minutes. For elderly individuals, however, a gentler, safer approach focused more on consistency is ideal, with just 10–20 minutes of simple rotational and light strength exercises 2–3 times per week leading to significant improvements in flexibility, posture, breathing, and overall daily function.

References 104-108.

High intensity over high repetitions for muscle growth

> *"I'd rather you trade that in the repetitions for the intensity because the, the tension delivered to the muscle with the higher level of, of weight you're using, or the intensity of the technique that you're using is gonna have bigger benefits in a, in a faster way. Than just accumulating a lot of high repetitions. Now, that's not to say that you can't actually benefit from high repetitions and develop muscle. You can, they've actually shown, um, recently that anywhere between five and 30 repetitions taken close to or all the way to failure can stimulate muscle growth. The absolute load is sometimes not even as important as long as the effort is there."*

Research shows that maintaining and improving strength depends more on training intensity than on high repetitions or volume. Strength can be preserved with significantly reduced training frequency and volume, as long as the loads remain challenging. High-repetition, low-intensity training primarily supports muscular endurance, but it is not effective for maintaining or building maximal strength. Moderate to low repetitions combined with high intensity are key for keeping strength levels stable over time. Optimal repetition ranges for maximal strength gains typically fall between 1–6 reps per set at 85–100% of one-rep max (1RM), while muscle hypertrophy is best supported with 6–12 reps at 65–85% of 1RM. Studies have shown that, in recreationally trained individuals, performing three sets per exercise with equal intensity produces greater strength gains than performing only one set. Similarly, in experienced weightlifters, moderate training volumes at high intensity yield better strength outcomes compared to very low or very high training volumes. For beginners, even one weekly session at lower intensities (around 50% 1RM) with three sets of multi-joint exercises is sufficient to improve fitness and muscle strength. Overall, consistent, high-intensity training tailored to experience level is the most effective strategy for maintaining and enhancing strength over time.

References 109-113.

Should the elderly train with high repetitions?

> *"But I believe that as you get older, you gotta kind of spare some of those repetitions because it has that same effect that just wearing down those tires would have."*

Resistance training with lighter weights and higher repetitions can still lead to significant improvements in muscle strength and size in older adults, as long as enough repetitions are completed. Although heavier weights often lead to slightly greater strength gains, the difference is small—especially if the total work is matched. For many older people, high-intensity training may not be safe due to health or mobility issues. In these cases, high-repetition, lower-load training provides a safer, yet still effective, alternative.

References 114-116.

Training to failure *vs* reps in reserve

> *"So, former's very important because I think doing things in proper form do two things. Number one, it keeps you safe. You know, most likely if you can do something in good form, then you're in command of the weight that you're, you're lifting and therefore it's likely going to, um, do what it's supposed to do with the least detrimental effect from doing it. In terms of the leeway that you have, I think that depends upon the goal that you, that you're trying to achieve. So if you're trying to achieve muscle growth, I, I'm a big believer that muscle growth is not given. It is taken and you need to force yourself, you need to force your body to make a change. 'cause your body wants to stay in a state of homeostasis. It wants to stay the same and. Getting it to deliver new muscle tissue to your body is metabolically demanding, right? It's creating more tissue that's gonna require a higher metabolic demand. It doesn't wanna do that again, homeostasis states that it wants to keep you the same. You have to take that, and the only way to take that is to put forth an effort and an intensity that is above and beyond what your body is able to do right now. That's why I, I am a big believer in performing our sets to failure. Not because I think that absolute failure is a hundred percent necessary, but it's the only objective endpoint for you and I to speak the same language here."*

> *"If you stop at an estimated one or two reps shy, which is what research would say, is okay, you know, passable, same, same result potentially."*

Multiple meta-analyses and systematic reviews show that training to failure does not result in greater strength gains compared to non-failure training when total training volume is matched. In some cases, non-failure training may even slightly favor strength improvements, especially when

training volume is not equalised between groups, but the difference is small and likely not meaningful in practice. In terms of muscle hypertrophy, some evidence suggests a slight advantage for failure training in resistance-trained individuals, but overall, hypertrophy outcomes are comparable between approaches. Interestingly, markers of muscle damage (e.g., creatine kinase) are higher after failure training, indicating more muscle stress and a longer recovery period. It's also important to note that training to failure is associated with higher ratings of perceived exertion and discomfort, which may negatively impact adherence and enjoyment.

Stopping 1-2 reps short of failure allows for better effort regulation and may reduce the risk of overtraining or injury. When using the "reps in reserve" approach, the number of repetitions completed can vary more between individuals and exercises, but effort is more consistently regulated. However, a study showed most individuals can accurately estimate when they are 1-2 reps from failure.

References 117-125.

Thoracic spine pain

> *"Yeah. And if I'm not here, then I'm on my phone and I'm staring downwards And we spend most of our lives now staring downwards. Yeah. And I just wondered if you, how, how you think about that. I mean, it's good. It's good. It is a good, um, it is a good connection back to what we talked about. 'cause I believe that still comes from that epicenter of dysfunction, which is that thoracic spine."*

Maintaining an extreme flexed posture of the lower cervical and upper thoracic spine (similar to slouched sitting) caused pain in all healthy subjects within 15 minutes, with pain sometimes lasting up to four days. The pain was primarily located in the lower cervical and upper thoracic spine, suggesting that such postures can directly provoke thoracic pain. Additionally, reduced extension mobility (ability to straighten the upper back) in the thoracic spine is associated with higher pain scores, while greater flexion mobility is linked to lower pain scores. Less kyphotic (less rounded) thoracic posture is also associated with lower pain.

References 126-130.

Optimal amount of sets per week for muscle hypertrophy

> *"But typically you're looking for around anywhere between nine and 16 sets or so for that muscle group across the week."*

Studies suggest that increasing the number of sets per week can enhance muscle hypertrophy. For example, one study demonstrated that performing 24 to 32 sets per muscle group weekly resulted in greater increases in muscle thickness compared to lower volumes. However, another study reported that increasing volume beyond 20 sets per week does not consistently lead to greater hypertrophy and may even result in diminishing returns or overtraining for some individuals. A 2022 review concluded that 10 sets per week per muscle group is optimal for maximising gains. Other studies also indicates that performing 5 to 10 sets per muscle group each week may be sufficient to achieve improvements in both muscle growth and strength.

References 131-134.

Creatine kinase

> *"In a perfect world, if somebody could measure at a local level the recovery of the muscle, and I had this, you know, thought where I always think if you could just, there there's a, there's a, a, an enzyme that's released, uh, creatin phosphokinase, CPK, within a muscle at a local level that sort of is a, a sign of muscle damage or the, you know, the, the, the insult that is the precursor to change, right. If you can measure that and know that, hey, on day three in six hours that has restored the baseline, then technically you can go back and train that muscle again. And what you would do is you would optimally keep stimulating right at the time without dipping into that, under training or under, you know, the, the over recovery, under training element where it dips down below the line."*

Creatine kinase levels typically rise after resistance exercise, peaking between 24 and 72 hours post-exercise, with mean increases ranging from 2.5 to 4.5 times baseline depending on the muscle group and exercise type. However, there is high variability, with some individuals experiencing much higher peaks, especially after eccentric or high-intensity protocols. While CK is a useful indirect marker of muscle damage and training intensity, its high variability and sensitivity to

non-exercise factors limit its reliability for diagnosing overtraining or guiding recovery in all individuals.

References 135-138.

Resistance training cessation and muscle mass loss

> *"Do, is there like a broad idea of how long it takes to lose muscle for like if, just generally because I've heard a variety of things. Yeah. I heard once someone say it takes roughly two weeks for you to start to lose the muscle. Is it, what's the way, it's not hypertrophy, is it? That's when you build it, right? Hypertrophy when you build it. Yeah. So the opposite of that. Yeah. I mean, if you, if you, if you lose, if you're losing muscle mass, you are atrophy is, is the word that you were looking for. But if you, if you lose muscle mass, it happens for a bunch of different reasons.*
>
> *So like if, if, if you had not hurt your ankle but to your ACL within two days, your quad would be half the size it was. Wow. Because neurologically it's shut off. It's a protective mechanism to try to make sure that you're not contracting. Um. The muscles over the joint that's injured. So it's trying to protect you. So your body has the ability to make really fast adaptations downward, but it's not permanent. And even when it comes to losing muscle mass, yeah, two weeks you can start to see a difference if you're not training."*

Stopping resistance training leads to a gradual loss of muscle mass, with the rate and extent of loss depending on how long training is stopped. Significant muscle mass loss typically becomes evident after several months and is more pronounced after a year without resistance training. A meta-analysis showed muscle mass is generally well preserved for the first 3–6 months after stopping resistance training, with only minor decreases observed in older adults during this period. After 6-12 months of resistance training cessation, noticeable and significant muscle mass loss occurs. Studies show that after one year without resistance training, most of the muscle mass gains from previous training are lost, and muscle size often returns close to baseline levels. Interestingly, individuals who continue any form of resistance training, even at a reduced frequency, experience less muscle mass loss compared to those who stop completely.

Regarding complete unloading (no use of a limb), after three weeks, muscle volume and cross-sectional area can decrease by about 10% and 3%, respectively, with a corresponding drop in muscle strength.

References 139-143.

Grip strength

> *"I was doing some reading beforehand. It's a grip strength. Yeah. Reader monitor. Um, and there's some really crazy stats that I found. There was a 2015 Lancet study across 17 countries that found for every five kilogram decrease in grip strength. It was associated with a 16% high risk of death, a 17% high risk of heart disease. And a 7% high risk of stroke. And a 2018 study in the Journal of Alzheimer's Disease found that people with low grip strength had a 68% high risk of developing Alzheimer's. There was another, another study that linked it to other cardiovascular, um, and blood issues. And, uh, another study that shows that older adults in the lowest third of grip strength were 2.5 times more likely to fall and be hospitalized with their injuries. And I'm not done yet. Um, one study found that grip strength predicted upper body strength by 70%. And lastly, adults over 65 with weak grip strength were 2.1 times more likely to become dependent in daily activities within three years. That was in the Journal of Gerontology Grip strength. Pretty important, huh?"*

- *"2015 Lancet study across 17 countries that found for every five kilogram decrease in grip strength. It was associated with a 16% high risk of death, a 17% high risk of heart disease. And a 7% high risk of stroke"*

  This statement is correct according to the publication mentioned, except a 9% higher risk of stroke was found.

Reference 144.

- *"2018 study in the Journal of Alzheimer's Disease found that people with low grip strength had a 68% high risk of developing Alzheimer's."*

A systematic review and meta-analysis reported that poorer grip strength is associated with a 41% higher risk of Alzheimer's disease and a 45% higher risk of non-Alzheimer's dementia.

Reference 145.

- *"Another study that shows that older adults in the lowest third of grip strength were 2.5 times more likely to fall and be hospitalized with their injuries"*

Studies have shown that as grip strength decreases, the risk of falls increases. Each standard deviation decrease in grip strength is linked to a 16–27% higher risk of falls. Other studies showed that lower grip strength is independently associated with a higher risk of falls in older adults, with odds ratios for low grip strength ranging from about 2.3 to 2.5 for increased fall risk compared to those with higher grip strength.

Reference 146-153.

Grip strength in men

> *"What's a good grip strength? So most men would be somewhere between a hundred. I'll talk pounds, uh, a hundred to 120 pounds. So if you look at that, that's around 46 kilos to 54 kilos."*

In men, grip strength generally peaks between the ages of 30 and 39 and then gradually declines with age. The average grip strength for men typically ranges from 105 to 213 pounds (47.5 to 97 kg), with the average around 116 pound-force.

References 154-155.

Back pain and its prevalence in the UK

> *"I was looking at some stats beforehand and it says that 80% of people will experience back pain at some point in their lives. It's actually the leading cause of disability worldwide. Yeah. In the uk, over 10 million workers lost every year due to back pain. One in six hospital visits in Britain are related to back pain. It's the most common reason for people under 45 to see a doctor. And chronic back pain, which is sort of just enduring back pain, affects about one in five adults in the uk."*

Musculoskeletal conditions, particularly low back and neck pain, along with neurological disorders like stroke, depressive and other mental health conditions, and headache disorders, are among the leading causes of disability worldwide.

In 2022/23, musculoskeletal disorders made up 27% of all work-related ill-health cases and were responsible for 21% of all working days lost due to work-related ill health—equivalent to 6.6 million days. This figure rose to 7.8 million working days lost in 2023/24. The impact of musculoskeletal conditions extends beyond lost productivity: in 2022/23, the employment rate for disabled people with musculoskeletal conditions was 57.5%, compared to 75.7% for the overall population aged 16 to 64. Overall, 2.4 million disabled people—24.4% of the disabled population—report a musculoskeletal condition as their main health issue.

Back pain has become an increasingly common cause of hospital outpatient visits, rising fivefold over a decade. Chronic low back pain affects between 6.3% and 11.1% of the UK population, with prevalence varying by region, being higher in coastal areas and lower in urban centres.

References 156-162.

Prevalence of back pain in the US

> *"26% of the time at any one time in the United States, people have, are gonna be dealing with back pain."*

Chronic pain affects over 20% of adults in the United States, with back pain being the most common type. Recent data show that around 26% of workers and 34% of community-dwelling adults

reported back pain within a three-month period. The Midwest has the highest rates of lower back pain, particularly among women and adults aged 25 to 49.

References 163-166.

Back pain as one of the most common doctor visits

> *"I find interesting is that the second leading cause of trips to the doctor in the United States is back pain behind respiratory infection"*

Studies suggest that respiratory infections, such as the common cold, are the leading cause of doctor visits in the United States. While back pain is often cited as one of the most common reasons for seeking medical care, there is no consistent confirmation that it is the second leading cause. In 2007, for example, emergency department data showed that unintentional falls—not back pain—were the leading cause of injury-related visits. Nonetheless, there is strong and consistent evidence that back pain remains a major reason for physician visits, although its exact position among other causes varies across studies and over time. Some research identifies back pain as the second most common reason for doctor visits, while others focus more on its substantial cost and long-term impact.

References 167-169.

Low back pain lifetime prevalence: its association with disk issues and surgeries

> *"80% of the people, or 85% will have low back pain in their life. Only 27 to 35% of the time is it disc related. "Now, again, even of the disc related issues, the 27 to 35%, 96% of those are not operated on"*

Low back pain is a major global health issue, affecting more than half a billion people in 2020, with prevalence expected to exceed 800 million by 2050. Between 50% and 80% of adults experience at least one episode of back pain during their lifetime, and in the United States, lifetime

prevalence is estimated to be as high as 65–80%. Occupational factors, smoking, and high body mass index are significant risk factors. Disc-related abnormalities, such as degeneration, herniation, and internal disc disruption, are common causes of low back pain, found in 32–46% of affected patients, particularly among younger adults and those with chronic symptoms. Data show that intervertebral disc issues are the most frequent cause of chronic low back pain in adults, with discogenic pain being more common in younger individuals, while facet joint or sacroiliac joint pain tends to occur more in older patients. In older adults, the high prevalence of chronic low back pain is often linked to obesity, mental health conditions such as anxiety and depression, and lifestyle changes.

Disc-related back pain surgeries, such as lumbar discectomy, are most common among adults aged 26–60, with surgery rates around 2.1 per 1,000 people annually. While exact percentages may vary, it is well-established that the vast majority of disc-related low back pain cases are managed without surgery, as conservative treatments like physical therapy, medications, and lifestyle modifications are effective for most patients. Surgery is typically reserved for those who do not respond to these approaches or who have significant neurological deficits. Even among those who undergo surgery, outcomes are not always fully successful: 15–25% of patients may experience persistent or recurrent pain, and approximately 14.97% develop ongoing issues known as failed back surgery syndrome.

References 170-176.

Lower back injury

> *"If you're not getting mobility from your hip or from your thoracic spine up and above and below, it's gonna ask for it from the next place above, you know, above it or below it. It's gonna say to the low back, please help out, gimme the mobility that I lack. So the low back will do it, but at an expense and that's where you get injured."*

Lower back injuries are most commonly caused by structural issues such as disc degeneration, spondylolysis, and spinal instability, as well as by overuse and repetitive movements like lifting, bending, or participating in sports. Inflammatory and neuropathic processes can also contribute, and psychological factors—including stress, anxiety, and depression—are increasingly recognised as important contributors to both the onset and persistence of back pain. Key risk indicators for recurrent non-specific low back pain, especially in adolescents, include limited hip

range of motion, reduced abdominal muscle endurance, decreased lumbar flexibility, and impaired lateral flexion of the spine. Studies suggest that restricted mobility in the hip or thoracic spine can lead to compensatory stress on the lower back, altering movement patterns and increasing injury risk. However, findings are not entirely consistent; for example, research in young elite athletes did not find a direct correlation between hip or thoracic mobility and the development of low back pain, indicating that other factors—such as sport-specific demands, muscle imbalances, and individual biomechanics—may also play critical roles.

References 177-180.

Walking

> *"I think people need to, um, get up and walk around just a little bit. Five minutes, every, every, you know, 30 minutes or so would be ideal"*

Walking is a safe, accessible, and effective intervention that can help reduce pain, decrease disability, and improve function in individuals with chronic low back pain, showing effects comparable to other forms of exercise.

References 181-183.

Amount of protein per pound of body weight

> *" for me, my daily goal is around, at minimum a gram per pound of body weight and upwards of 1.2 grams per pound of body weight if you're active."*

The recommendation of consuming one gram of protein per pound of body weight (approximately 2.2 grams per kilogram) is widely circulated in fitness and bodybuilding communities. Evidence suggests that higher protein intake can support gains in lean body mass and promote fat loss, particularly when combined with exercise. For example, one study found that consuming 2.4 g/kg/day of protein during a calorie deficit led to greater improvements in lean mass and fat loss compared to 1.2 g/kg/day. In older adults, a daily intake of 1.0–1.2 g/kg is generally recommended, with higher amounts (1.2–1.5 g/kg) advised for those at risk of malnutrition. Despite these findings,

there is no universal agreement on the optimal daily protein intake, as individual needs vary depending on age, health status, and physical activity levels.

References 184-187.

Creatine supplementation

> *"To the neurological benefits that creatine is showing in terms of depression and, um, degenerative neurological diseases and, and its improvement, its ability to slow, prevent things like, uh, MS and Parkinson's and, you know, by basically keeping the brain in a more favorable, uh, bioenergetic state. Meaning be able to, to feed the, the, the neurons of the brain, um, with the energy that seems to be lacking in some of these degenerative diseases."*

> *"it's been shown to actually improve brain health and performance in sleep deprived and in stressed high stress states. Um, again, from a depression standpoint, it's being shown to be. Very effective, even when kind of paired up with traditional approaches to treating depression through pharmaceuticals. It's just got a lot of promise. And the good thing is that there's really no downside, right? They haven't really identified a downside to taking it. No."*

Creatine may help reduce the severity of, or enhance recovery from, mild traumatic brain injury and concussion. It also shows promise in supporting brain health in conditions like depression, ageing, and possibly neurodegenerative diseases, though more research is needed in these areas. Creatine increases brain energy stores, which may help maintain neuronal function during metabolic stress (e.g., low oxygen, sleep deprivation) and protect against cellular damage. Animal studies and early clinical trials suggest neuroprotective effects in models of Parkinson's, Huntington's, and amyotrophic lateral sclerosis (ALS), with ongoing trials in humans.

Creatine supplementation is generally considered safe for most people, with few adverse effects reported in studies. Optimal dosing strategies for brain benefits are not yet established, and more large-scale, long-term studies are needed to confirm effects in different populations and neurological conditions.

References 188-197.

Creatine and anabolic steroids

“Because the outcomes are the same as, let's say, anabolic steroid use doesn't mean that the mechanism is the same or the magnitude of what you're gonna see from them is the same. Or even the legality of, of the, of the supplement itself is the same. You're talking about two completely different, uh, two diff 2, 2, 2 different mechanisms completely and two different, uh, uh, things that the body are gonna react much differently to when it's an anabolic steroid. It's going into the muscle cell, bind into androgen receptors that then go into the nucleus of the cell and change gene expression, right? To basically convert, as I did in that video, I said, you're taking an iPad and making it a MacBook, right? You're, you're completely changing what it is.

Whereas with creatine monohydrate, you're just talking about providing a more constant flow of energy to those muscle cells so that they, they can continue to turn over faster and continue to operate at higher levels of performance. Well, what happens when that, when that occurs, you're able to generate more work in a, in a workout by getting more work done. You're creating more of that overload. You're also getting a secondary benefit of pulling water into the muscle cell with the creatine 'cause. Osmotically, when you pull water, uh, uh, anything into the cell, you're gonna bring along with it water to kind of keep the, um, the um, uh. Concentration inside the cell to be the same. Well, that extra water keeps the muscle cell hydrated, and that's a great thing. A more, a hydrated muscle cell is gonna likely grow better longer in, in the, in the long run, just like a flower of water would grow better than one without. So there's a lot of benefits.”

Creatine and anabolic steroids are both used to boost athletic performance and muscle growth, but they work differently and carry very different risks. Creatine helps muscles produce quick energy during intense exercise and may promote muscle growth by increasing certain growth factors. It is especially effective for improving strength and performance in resistance and power sports. Creatine is also considered safe when used properly, with few side effects and benefits even seen in older adults.

Anabolic-androgenic steroids (AAS), like oxymetholone and nandrolone, are synthetic forms of testosterone that build muscle by increasing protein production and muscle cell growth. While AAS can lead to greater muscle gains than creatine, they come with serious health risks, including

hormonal problems, infertility, and damage to reproductive tissues. Unlike creatine, misuse of AAS can have long-term, harmful effects on health.

References 198-201.

Prevalence of high school males taking creatine

> *"22% of high school males take creatine right now"*

Creatine use is relatively common among high school athletes, particularly males, with reported prevalence ranging from 8.8% to as high as 30%. Usage tends to increase with age and is more frequent among participants in strength-focused sports such as football. Notably, both male and female athletes as young as 14 years old have been documented using creatine. In one study, 8.2% of surveyed high school athletes reported using the supplement. Among grade 12 students, usage was especially high, with 44% acknowledging creatine use. Males were significantly more likely to use creatine than females, with 8.8% of boys and only 1.9% of girls reporting use. Despite its popularity, creatine use was associated with minor side effects such as diarrhoea, muscle cramps, and reduced appetite. Importantly, many young users appear to believe that creatine enhances athletic performance, though they may lack the necessary knowledge to make fully informed decisions about its risks and benefits.

References 202-204.

Creatine use in females

> *"3% of females taking it in high school are there that less high school athletes that are female, no, they're just still worried about the confusion perhaps between an anabolic steroid and this, just because, again, outcomes in terms of like, yeah, strength and size."*

Creatine use among high school females is relatively low, with prevalence estimates ranging from 1.8% to 4%. In one study, 8.2% of high school athletes reported using creatine, but only one of these users was female.

Many women—but also many people in general—mistakenly believe that creatine is a steroid or assume it's only for those aiming to gain significant muscle or strength. Concerns about water retention and weight gain also contribute to hesitancy. This confusion likely arises because both creatine and steroids are linked to muscle growth and athletic performance. However, they are fundamentally different: creatine is a natural compound that supports energy production in cells, whereas steroids are synthetic hormones that carry significant health risks.

While most creatine research has focused on males, existing evidence suggests that supplementation is safe for females and not associated with increased risks of mortality, serious side effects, weight gain, or liver and kidney dysfunction. Emerging studies also indicate that creatine may offer unique benefits for women, including improved muscle strength, exercise performance, and brain health. These effects may be especially valuable during hormonally dynamic periods such as menstruation, pregnancy, postpartum, and menopause, when creatine needs may increase due to physiological changes.

References 205-209.

Long-term safety for anabolic steroids and creatine

> *"And again, long-term safety is not there for anabolic steroid use as it is for this supplement."*

Long-term use of anabolic-androgenic steroids is linked to serious health risks, including heart disease, atherosclerosis, and cognitive or psychiatric issues. In contrast, research consistently shows that daily creatine supplementation is safe, even over several years.

While creatine can cause a slight increase in blood creatinine levels—a marker typically used to assess kidney or liver function—this does not indicate harm to these organs. Multiple studies found no negative impact on kidney function. Studies have found no significant harmful effects from high doses (up to 30 g/day) taken for as long as five years. In fact, athletes who use creatine long-term often experience positive health benefit.

The International Society of Sports Nutrition (ISSN) also affirms that no research to date has shown harm to the kidneys or liver in healthy individuals using creatine. However, individuals with a

history of liver or kidney conditions should consult a healthcare provider before beginning supplementation as a precautionary measure.

References 210-215.

Phosphagen HP

> *"It was called, uh, phosphagen, hp, but all it was was great to amount hydrate. Um, but they, but you know, they were using the science, they were leading with the science and the safety of it. So I took it and I remember going, wow, like this literally worked like within two weeks I put on about four, five pounds, three four pounds of muscle, or I three or four pounds, not from muscle. A lot of it comes from that water that comes into the muscle cell. But I noticed my strength improved. I felt better and I never stopped."*

Phosphagen HP, a creatine supplement, enhances muscle mass, strength, and sprint performance by boosting intracellular creatine and water uptake. When creatine is stored in muscles as phosphocreatine, it draws water into the cells through osmosis, leading to cell volumisation. This swelling may activate muscle-building pathways and contribute to temporary, safe weight gain from water—not fat. A well-hydrated environment enhances creatine transport and muscle function, supporting higher training intensity and recovery. By fuelling the phosphagen system, creatine also helps regenerate ATP quickly during short bursts of effort, ultimately improving strength and performance.

References 216-219.

Creatine monohydrate and creatine hydrochloride and loading

"I always present it in sort of two forms to people because there's a, there's one creatine monohydrate, and then there's one called creatine hydrochloride. And the only difference is what it's bound to. The creatine monohydrate is bound to a H2O molecule and the hydrochloride is bound to a hydrochloric acid molecule. And so what happens when that's ingested in your body is that one's more absorbable than the other. The hydrochloride is more absorbable than the other. So you could take lower dosages of that. The creatine monohydrate is usually taking at a higher dosage. And now there's some new research coming out that states that, I used to think that it was just five grams for everybody. Mm-hmm. But now they're finding that people that are like upwards of 200 pounds or more, they might benefit from like 8, 9, 10 grams per day. So bigger dosages there and people who are at, you know, 120 pounds or so, and maybe some of the females and female athletes, like they might benefit from even just two to three grams of creat monohydrate hydrochloride is usually in lower dosage anyway, so a comparative dose of five grams of monohydrate might equal out to two to three grams of hydrochloride. What's all this stuff about loading? Because when I was younger, my brother was bodybuilding. He would, he would tell me that you had to load up. Yeah. I You had to have a huge dosage for a week. Yeah. And then thereafter go back to a low dosage. It's just, so your body ultimately reaches a capacity for creating storage. So if you wanna get there faster, you load it's five grams, four to five times a day. So a total dose of 20 to 25 grams in a day. Some people are gonna find that that's a little, little bit of an overload for them on their, on their gut. There is a, there is a, uh, a, a, a byproduct of creatine breakdown."

Creatine monohydrate and creatine hydrochloride (HCl) are two commonly used forms of creatine that differ primarily in their chemical structure and dosing recommendations. Creatine monohydrate is the most extensively studied form and consists of creatine bound to a water molecule, whereas creatine HCl is creatine bound to a hydrochloride group, which makes it significantly more water-soluble. Although creatine HCl is often marketed as having superior absorption and reduced side effects, current scientific studies do not show conclusive evidence that it is more effective or better absorbed in the body than monohydrate. Due to its high solubility, creatine HCl is typically consumed in smaller doses (e.g., 2–3 grams) compared to the standard 5-gram dose of creatine monohydrate. Both forms can increase muscle creatine stores, but creatine monohydrate remains the gold standard due to its robust safety profile and extensive research

support. Some users report less gastrointestinal discomfort with HCl, especially at high doses, though splitting the daily dose of monohydrate can similarly reduce such side effects.

References 220-224.

Creatine loading

Creatine loading is a strategy used to quickly saturate muscle creatine stores by consuming approximately 20 grams of creatine monohydrate per day, divided into 4 doses, for 5 to 7 days. Scientific studies have shown that this method can increase muscle creatine content by about 20% within a week, leading to improvements in strength, sprint performance, and training capacity. However, research also confirms that similar benefits can be achieved without a loading phase by taking a consistent daily dose of 3 to 5 grams, though it takes about four weeks to reach full muscle saturation. While the loading approach is safe for healthy individuals, some people may experience mild gastrointestinal discomfort or bloating—side effects that are often minimised by spreading out the doses or opting for the gradual approach. Ultimately, creatine loading is effective but not essential; both methods are supported by evidence and yield the same long-term performance benefits.

References 225-230.

Creatine monohydrate and water retention

> *"Creatinine is what it's called. If we get it measured whenever we get our blood test done, um, that can sometimes pull along with it some extra water and that can make you feel a little gut discomfort from that. Again, at lower dosages, if you're using hydrochloride, you wouldn't see that breakdown as much. You wouldn't, you wouldn't get as much of that accumulated breakdown in creatinine. So you might get less of that Bloating. Bloating. That's the only indication why I would ever suggest hydrochloride is if you are some of that 15% of people that have some sensitivity to that, and a lot of times getting around the loading phase and not doing it."*

Some studies confirm that creatine monohydrate supplementation increases total body water. This increase is observed both after short-term loading phases and with longer-term use. The most commonly reported side effect is transient water retention, particularly in the early stages of supplementation. However, this is generally mild and not associated with significant bloating or discomfort for most users.

References 231-237.

Creatine saturation without a loading phase

> *"So what happens if you don't load? You just ultimately get to the same capacity at a slower pace. So anywhere from 27 to 35 days or so, you're gonna reach that full capacity anyway. If you're taking it because you want to see benefits and performance like power output and performance, let's say leading up to an event that's, you know, a competition in four or five days, then you might wanna load."*

Supplementing with 3 grams of creatine per day increases muscle creatine levels by about 20% over 28 days, reaching similar saturation levels as the rapid loading protocol but at a slower pace. The traditional loading phase (20 grams/day for 5–7 days) achieves saturation in about 6 days, after which a lower maintenance dose (2 grams/day) maintains elevated levels.

References 238, 239.

Role of protein in muscle hypertrophy

> *"protein's gonna be the most responsible macronutrient for getting you to the, to the goals of building more muscle."*

Protein intake is essential for stimulating muscle protein synthesis (MPS), which is the key process for muscle growth. Both the amount and quality of protein, especially those rich in essential amino acids like leucine, are critical for maximising MPS and muscle hypertrophy.

References 240-244.

Muscle hypertrophy in a caloric deficit

> *“So it's actually possible to build muscle in a caloric deficit. Some people don't think that's possible. They think you're fighting goals. Like if you wanna build muscle, you need to be in a surplus. And if you wanna lose, you have to be in a, you know, lose body weight. You have to be in a, in a deficit. It's not, it's not actually true. If you wanna create a fat loss effect, you have to be in a caloric deficit. But you can still create hypertrophy and muscle gain, albeit at a slower pace. But you can still create it if you're maintaining high enough levels of protein, 'cause you're staying in something called positive nitrogen balance.”*

The phenomenon of "body recomposition"—simultaneous fat loss and muscle gain—has been observed in various populations, including athletes, sedentary individuals, and those with excess weight, when nutrition and training are carefully managed. While an energy surplus is generally considered beneficial for maximising muscle hypertrophy, the exact amount required is unclear, and individual responses vary widely. There is no validated “sweet spot” for energy intake that optimises muscle gain relative to fat mass.

References 245-250.

Meal frequency

> *“I think there is some, um, valid benefits to eating more frequently throughout the day, right? The old standard bodybuilding diet was eat six times a day, right? The three main meals and even in between. And then after your final meal, there's a lot of benefits from that. You stabilize blood sugar, you get less, less of those up and down, you know, crashes and, and, and I think that has its own benefits, but it just gives you more opportunities to get some of the calories in that are needed to, um, to, to put on weight.”*

Research shows mixed results: eating more frequently can be linked to better diet quality, but it may also be associated with higher calorie intake and increased risk of overweight in some groups. A review of weight-loss and maintenance interventions found no consistent association between eating frequency and weight or health outcomes, though there may be a slight benefit for blood lipid levels in some cases. Approaches that focus on mindful or intuitive eating, rather than

meal frequency or weight are associated with better physical and mental health, improved diet quality, and healthier body weight.

References 251-255.

Protein concentrates *vs* protein isolates

> *"So in general, your isolate proteins are gonna be of a higher quality than your concentrate proteins. Um, they're still protein, but there's more on a gram per gram basis. Uh, it's 90% versus 80%, um, by volume, if it's isolate versus concentrate."*

Protein concentrates typically contain 35–90% protein, depending on the source and extraction method, while protein isolates generally have >90% protein content.

References 256-258.

Amino acid spiking and muscle growth

> *"How do I spot garbage? Uh, I think the best way to spot garbage would be to, like, there's something called, uh, amino acid spiking, like people will, will actually include a lot of, um, glycine in their, in their, uh, proteins like spec, like adding glycine to it. 'cause they can get the label benefit of increasing protein content, but it's actually not a complete protein. So you're not getting the actual quality that you would be getting from an is isolate protein. So you can look out for that. But ul ultimately I think what is most important is, like, I prioritized the amount of protein per serving there. 30 grams per serving, and again, doing it at the most cost effective in the most cost effective way"*

While branched-chain amino acids (BCAAs), especially leucine, can activate molecular pathways related to muscle growth, their effect on muscle protein synthesis (MPS) is less than that of complete protein sources. BCAA supplementation alone does not consistently stimulate MPS or produce a net anabolic effect in humans and may even reduce muscle protein turnover. Additionally,

excess free lysine supplementation in lysine-sufficient diets reduces protein quality and alters serum amino acid profiles, potentially impairing growth and nutrient utilization.

References 259-262.

Synthetic food colourants

> *"You know, in, in Europe, they've known about the dangers of food coloring and food dyes for a decade or more, and we're still eating these in our foods all the time."*

Synthetic food colourants can cause allergic reactions and have been associated with toxic effects on organs such as the brain, liver, kidney, lungs, urinary bladder, and thyroid gland. Some dyes have been linked to tumour formation in animal studies and may contribute to various cancers and other adverse health effects. Additionally, there is evidence suggesting a link between artificial food colours and behavioural changes, including increased hyperactivity in children, as well as potential neurocognitive effects. These risks are especially concerning for children, including those with or without behavioural disorders like ADHD or ASD.

References 263-268.

Melatonin supplementation

> *"What about melatonin? I've got a little jar of it here that I found. Um, a lot of people are taking melatonin now, and I've got a friend very close to me that's encouraging me to take melatonin. Do you have a view on it? I really don't. I mean, my, my view is, I, I believe it to be safe. I believe it to be, um, helpful, you know, for people that. Are having a problem establishing a normal sleep pattern. Um, we actually do, uh, uh, give it to our children at night. 'cause they do have, they do have issues with sleep."*

Melatonin supplementation significantly improves sleep quality in adults, especially those with respiratory diseases, metabolic disorders, and primary sleep disorders, as measured by the Pittsburgh Sleep Quality Index. It is also effective in improving sleep quality, sleep duration, and sleep

efficiency in individuals with sleep disturbances following traumatic brain injury, with additional benefits for mood and fatigue.

Melatonin supplementation generally has a favourable safety profile. Most reported adverse events are minor and short-lived, such as fatigue or mood changes. Some studies note effects on endocrine and cardiovascular function, which may depend on dosage, timing, and drug interactions. Serious adverse events are rare, and most side effects can be managed by aligning dosing with natural circadian rhythms.

References 269-272.

Sleeping positions

> *"in general, I think the position that has the less, the, the least amount of, uh, negative side effects in terms of how you feel upon waking is to be in what we call the corpse, the corpse position. Just laying on your back with your arms sort of at your side or crossed over your, your belly like this."*

Side sleeping has been linked to better sleep quality, less neck, back, and shoulder pain, and fewer breathing problems compared to sleeping on the back (supine) or stomach (prone). The left side is particularly beneficial for reducing symptoms of gastroesophageal reflux and may help with obstructive sleep apnea. Sleeping on the back can worsen sleep apnea and has been associated with more lower back pain. Overall, while individual preferences vary, the lateral sleep position appears to offer the most advantages for general health and sleep quality.

Infants should always be placed on their backs to sleep to lower the risk of Sudden Infant Death Syndrome (SIDS).

References 273-276.

Bending knees while sleeping

> *“But then there's the sort of chronic effects of being a certain type of sleeper, like a side sleeper, especially some that like the sleep in the fetal position. They, they pull their knees up. You, the last thing you need is more hip flexion. It's like sitting like you're getting from a chair. You're creating your own chair in bed, right?”*

Prolonged leg bending, whether sitting or lying down, can impair endothelial function in the popliteal artery due to low and disturbed blood flow. When lying on your back, the heel's contact with the mattress creates a knee-extension moment, potentially causing compression loading on the knee.

References 277, 278.

Best pillow height

> *“the healthier position is to sleep with a really flat pillow”*

The best pillow height generally falls between 7 and 7–11 cm for most adults, but the optimal height can vary based on sleeping position and individual body dimensions. Pillows with ergonomic designs and supportive materials further enhance sleep quality. Pillows with a height of 7–8 cm are most comfortable and support proper spinal alignment for back sleepers. Side sleepers benefit from slightly higher pillows, typically in the 9.7–13.8 cm range, especially when the pillow includes neck support. Medium individualised heights (about 9.7–11.8 cm) best match the natural cervical curve and minimise neck muscle strain, while slightly higher pillows (11.8–13.8 cm) may feel most comfortable for some.

References 279-284.

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