Fitness

This section examines markers that influence the functionality of genes related to physical performance traits. It allows you to customize your training plan based on your genetic profile and provides guidance on the optimal product combinations for your specific body type. By using the information as a reference, you can make lifestyle changes that enhance your overall fitness and optimize your workout routine.

Fitness - Athletic Performance

Physical Activity and Overall Health

Exercise, also known as physical activity (PA), refers to any movement of the skeletal muscles that requires energy expenditure. This includes activities such as lifting weights, exercising, playing sports, traveling, walking, cycling, dancing, gardening, and doing housework. Physical activity plays a vital role in maintaining physical health and mental well-being, providing benefits for overall wellness. Furthermore, a lack of physical activity raises the risk of developing non-communicable diseases (NCDs) and leads to worse health outcomes and higher death rates in people who already have these conditions. In contrast, being physically active helps lower the risk of NCDs, including heart disease, type 2 diabetes, and cancer, and provides greater protection at higher activity levels.

About your result

LOWER POTENTIAL | NORMAL POTENTIAL | **HIGHER POTENTIAL**

Your genetic profile indicates you may experience increased benefits from physical activity, potentially contributing more significantly to your overall health outcomes.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

To optimize your higher potential to benefit from exercise, you should consistently fuel your body with a healthy, nutrient-rich diet to enhance your performance. The synergistic relationship between proper nutrition and exercise not only enhances performance and recovery but also contributes to overall health outcomes.

Carbohydrates are not just a fuel source but also a regulator of training adaptations. Strategic carbohydrates intake before, during, and after exercise can significantly enhance performance and training outcomes. Studies have confirmed that high pre-exercise muscle glycogen stores can improve endurance and team sport performance in those instances where exercise duration is >60-90 minutes. The conventional approach to carbohydrates fuelling during exercise is to consume 6-8% carbohydrates beverages. Adults engaging in endurance or high-intensity exercise should personalize their carbohydrates intake based on exercise duration, intensity, and individual tolerance.

Dietary supplements can enhance exercise performance, recovery, and health when used strategically and safely. Caffeine, carbohydrate gels/drinks, beta-alanine, and beetroot juice are effective for endurance training; creatine and protein can support strength training and muscle growth; and probiotics, electrolytes, and vitamin D promote overall health. Always prioritize a "food first" approach and choose high-quality, independently tested products to minimize risks and maximize benefits.

A study evaluated three different 12-week interventions which included increasing exercise and fruit/vegetable intake while reducing sedentary screen time simultaneously, first increasing fruit/vegetable intake and reducing screen time then increasing exercise, and improving sleep and reducing stress as the control. The findings showed that interventions promoting a healthy diet and physical activity influenced DNA methylation patterns in genes associated with cell cycle regulation and cancer development, highlighting their importance in supporting overall health.

Source:

Close et al. (2016). New strategies in sport nutrition to increase exercise performance. Free Radical Biology and Medicine, 98, 144–158. https://doi.org/10.1016/j.freeradbiomed.2016.01.016 26855422

Close et al. (2016). New strategies in sport nutrition to increase exercise performance. Free Radical Biology and Medicine, 98, 144–158. https://doi.org/10.1016/j.freeradbiomed.2016.01.016 26855422

Hibler et al. (2019). Impact of a diet and activity health promotion intervention on regional patterns of DNA methylation. Clinical Epigenetics, 11(1). https://doi.org/10.1186/s13148-019-0707-0 31506096

Exercise

PERSONALIZE RECOMMENDATION

To build upon your higher genetic potential to benefit from exercise, you should maintain a regularly active lifestyle to support your long-term physical and mental health.

Recent observational studies provide compelling evidence for the benefits of physical activity in promoting optimal muscle mass development. A notable Swedish study involving 138 healthy preschoolers demonstrated that children engaging in higher levels of vigorous-intensity and moderate-to-vigorous physical activity showed improved fat-free mass index over time. These findings were further supported by a larger Brazilian study following 3,176 adolescents over seven years, which revealed positive associations between moderate and vigorous-intensity physical activity and body weight-adjusted lean soft tissue mass in both males and females.

Source:

Orsso et al. (2019). Low muscle mass and strength in pediatrics patients: Why should we care? Clinical Nutrition, 38(5), 2002–2015. https://doi.org/10.1016/j.clnu.2019.04.012 31031136

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
ACTN3	rs1815739	TT	3 PMID: 36197359
FTO	rs9939609	AA	1 PMID: 26888713
ADRB2	rs1042714	GC	1 PMID: 26888112

Fitness - Athletic Performance

Endurance Performance

A person's endurance performance depends on their endurance capacity, which is the crucial component of physical fitness that measures how long an individual can sustain continuous physical activity. Success in endurance sports like marathon running and long-distance cycling depends primarily on three physiological factors: the body's maximum oxygen consumption (VO2max), lactate threshold, and how efficiently the body uses energy during physical activity. However, these endurance capabilities vary significantly among individuals. While factors such as age, gender, and training habits play important roles in these differences, decades of research have revealed that genetic variations also significantly influence endurance potential. Scientists have identified numerous genetic markers linked to endurance performance, providing valuable insights into how our DNA shapes our endurance capabilities. This growing understanding of the genetic basis of endurance has important practical applications, such as the potential development of personalized training programs that consider an individual's genetic predispositions.

About your result

LOWER POTENTIAL NORMAL POTENTIAL HIGHER POTENTIAL

Your genetic profile suggests a more modest potential for endurance performance.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

Consider adopting a well-balanced diet as it provides the necessary fuel for optimal endurance performance.

When consumed 10-60 minutes before exercise, energy drinks and energy shots can enhance mental focus, alertness, and both anaerobic and endurance performance when they contain caffeine doses greater than 3 milligrams per kilogram of body weight. For maximizing lower-body power output, energy drinks and energy shots are most effective when they contain at least 3 milligrams of caffeine per kilogram of body weight. Energy drinks and energy shots can boost endurance, repeat sprint performance, and sport-specific tasks in team sports settings.

Dietary supplements can enhance exercise performance, recovery, and health when used strategically and safely. Caffeine, carbohydrate gels/drinks, beta-alanine, and beetroot juice are effective for endurance training; creatine and protein can support strength training and muscle growth; and probiotics, electrolytes, and vitamin D promote overall health. Always prioritize a "food first (over supplements and/or medications)" approach and choose high-quality, independently tested products to minimize risks and maximize benefits.

Carbohydrates are not just a fuel source but also a regulator of training adaptations. Strategic carbohydrates intake before, during, and after exercise can significantly enhance performance and training outcomes. Studies have confirmed that high pre-exercise muscle glycogen stores can improve endurance and team sport performance in those instances where exercise duration is >60-90 minutes. The conventional approach to carbohydrates fuelling during exercise is to consume 6-8% carbohydrates beverages. Adults engaging in endurance or high-intensity exercise should personalize their carbohydrates intake based on exercise duration, intensity, and individual tolerance.

Source:

Jagim et al. (2023). International society of sports nutrition position stand: energy drinks and energy shots. Journal of the International Society of Sports Nutrition, 20(1). https://doi.org/10.1080/15502783.2023.2171314 36862943

Close et al. (2016). New strategies in sport nutrition to increase exercise performance. Free Radical Biology and Medicine, 98, 144–158. https://doi.org/10.1016/j.freeradbiomed.2016.01.016 26855422

Close et al. (2016). New strategies in sport nutrition to increase exercise performance. Free Radical Biology and Medicine, 98, 144–158. https://doi.org/10.1016/j.freeradbiomed.2016.01.016 26855422

Exercise

PERSONALIZE RECOMMENDATION

Regular endurance training, such as aerobic exercises, running, swimming, or cycling, can improve your endurance performance. To improve your endurance gains and capacity, consider to start training regularly with the recommended entry level exercises before gradually increasing the duration and intensity as your fitness level improves.

For long-distance runners and cyclists looking to increase their endurance performance, incorporating High-Intensity Interval Training (HIIT) is a time-efficient and very effective strategy. One useful strategy is to add one or two weekly HIIT sessions to longer, steady-state training. These sessions consist of short bursts of near-maximal effort (e.g., 1–4 minutes at ≥90% max effort) interspersed with low-intensity recovery intervals. Its potent stimulus for muscular adaptations, particularly mitochondrial biogenesis, provides the scientific justification for its efficacy. This, along with an improved ability to oxidize fat, enables the body to use fuel more effectively and conserve its limited glycogen stores, which is essential for postponing fatigue during extended activity. Furthermore, even low-volume HIIT sessions can dramatically increase aerobic endurance by inducing these powerful physiological adaptations, which makes it an important part of an comprehensive training program.

While advanced endurance training often follows a pyramidal model involving high volumes of low-intensity work, a more effective approach is the "Norwegian Method." This method uses lactate-guided threshold interval training (LGTIT) to precisely manage intensity. This approach combines a high volume of low-intensity running with several key workouts per week. The cornerstone of this method is the LGTIT session, which consists of running intervals (e.g., 5 x 6 minutes) at a pace that is carefully controlled to keep blood lactate levels within the narrow threshold zone of 2.0–4.5 mmol/L. This often requires taking lactate measurements during the workout. The scientific basis of the method is that it enables athletes to spend significant time running at a fast pace. Running at this pace improves lactate threshold by enhancing lactate clearance and utilization without causing the deep fatigue that results from higher-intensity sessions. This precise control of internal physiological load enables faster recovery, allowing for a greater weekly volume of high-quality training and superior performance adaptations.

In addition to cardiovascular fitness, improving endurance performance depends critically on neuromuscular adaptations and muscle-tendon unit stiffness. A stiffer connective tissue system improves running economy by more efficiently storing and returning elastic energy with each foot strike, thereby reducing the metabolic cost of running. To develop these qualities, supplement traditional endurance training with explosive-type strength and plyometric exercises. For instance, adding two weekly sessions of exercises such as weighted squats, box jumps, and kettlebell swings can improve neuromuscular coordination and tissue stiffness directly. This type of training enhances movement efficiency, leading to measurable performance improvements, such as faster time trial results, by enabling athletes to sustain pace with less energy expenditure.

Source:

Atakan, M. et al. (2021). Evidence-based effects of high-intensity interval training on exercise capacity and health: A review with historical perspective. International Journal of Environmental Research and Public Health, 18(13), 7201. https://doi.org/10.3390/ijerph18137201 34281138

Casado, A., et al. (2023). Does lactate-guided threshold interval training within a high-volume low-intensity approach represent the "next step" in the evolution of distance running training? International Journal of Environmental Research and Public Health, 20(5), 3782. https://doi.org/10.3390/ijerph20053782 36900796

Hughes, D. C., et al. (2018). Adaptations to endurance and strength training. Cold Spring Harbor Perspectives in Medicine, 8(6), a029769. https://doi.org/10.1101/cshperspect.a029769 28490537

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
NFIA-AS2	rs1572312	GG	3 PMID: 25729143
PPARA	rs4253778	GC	1 PMID: 24996283
PPARGC1A	rs8192678	TT	1 PMID: 39766897
ACTN3	rs1815739	TT	1 PMID: 18718976
HFE	rs1799945	CC	1 PMID: 31970519

Fitness - Athletic Performance

Lean Body Mass

Lean body mass consists primarily of skeletal muscle (over 50%), which is essential for movement, temperature regulation, and metabolism. During early childhood, boys have slightly more muscle mass than girls, with research showing boys have about 10% more muscle around the spine before puberty. This difference becomes much more significant during puberty. While going through puberty, boys gain substantial lean mass but relatively little fat. By adulthood, men typically have about 1.5 times the lean body mass and skeletal mass of women. There are also differences in how muscle is distributed: men develop more muscle in their upper body and have more muscle mass in the front of their thighs compared to women. The increased muscle growth in adolescent boys is primarily due to rising testosterone levels. Testosterone promotes muscle protein synthesis and fiber growth while also increasing the breakdown of fat (lipolysis). While men typically have greater absolute strength due to their larger muscle mass, the strength relative to muscle mass is nearly identical between men and women.

About your result

LOWER POTENTIAL NORMAL POTENTIAL HIGHER POTENTIAL

Your genetic profile suggests a tendency towards a lower lean body mass, or that gaining lean body mass may require more focused effort.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

Given your lower genetic potential to lean body mass, you can adopt a healthy diet rich in nutrients as it is essential for supporting lean body mass. Incorporating a balanced mix of proteins, healthy fats, and complex carbohydrates can help fuel muscle growth and recovery.

The growing adoption of vegan diets stems from both environmental consciousness and health considerations. When combined with resistance training, which serves as a natural anabolic stimulus for lean mass preservation and fat reduction, dietary choices can significantly impact body composition. Research has demonstrated the effectiveness of both vegan and omnivorous diets when paired with resistance training, though vegan practitioners showed slightly better results in fat loss while maintaining lean mass. A comparative study revealed that individuals following a vegan diet alongside resistance training achieved greater reductions in body fat, showing a 1.20% decrease in body fat percentage and a 0.70 kg reduction in total fat mass, while preserving lean mass similarly to omnivorous counterparts. In comparison, those following an omnivorous diet with resistance training experienced a 0.90% decrease in body fat percentage and a 0.50 kg reduction in fat mass, with comparable lean mass retention. While both dietary approaches combined with resistance training led to improvements in body composition, the vegan diet appeared to enhance fat loss effects more substantially without compromising lean mass.

According to a consensus from major sports bodies including the American College of Sports Medicine (ACSM), International Society for Sports Nutrition (ISSN), and International Olympic Committee (IOC), athletes require a daily protein intake ranging from 1.2 to 2.0 grams per kilogram of body weight. This range significantly exceeds the Dietary Reference Intake (DRI) and, for a typical man, would equal roughly 84 to 140 grams of protein each day. For athletes specifically focused on reducing body fat while simultaneously increasing lean muscle mass through a combination of a slight calorie reduction and appropriate training, the IOC recommends an even greater intake of 1.8 to 2.7 grams of protein per kilogram of body weight daily.

Source:

Cárcamo-Regla et al. (2024). Effectiveness of Resistance Training Program on Body Composition in Adults Following Vegan Diet versus Omnivorous Diet; Developed in Mobile Health Modality. Nutrients, 16(15), 2539. https://doi.org/10.3390/hu16152539 39125418

Bytomski et al. (2017). Fueling for Performance. Sports Health: A Multidisciplinary Approach, 10(1), 47–53. https://doi.org/10.1177/1941738117743913 29173121

Exercise

PERSONALIZE RECOMMENDATION

Given that you have low genetic potential of lean body mass, consider adopting an active lifestyle through regular physical activity. Incorporating both strength and endurance training helps build and maintain lean body mass as well as supporting fat loss.

Recent observational studies provide compelling evidence for the benefits of physical activity in promoting optimal muscle mass development. A notable Swedish study involving 138 healthy preschoolers demonstrated that children engaging in higher levels of vigorous-intensity and moderate-to-vigorous physical activity showed improved fat-free mass index over time. These findings were further supported by a larger Brazilian study following 3,176 adolescents over seven years, which revealed positive associations between moderate and vigorous-intensity physical activity and body weight-adjusted lean soft tissue mass in both males and females.

Research has demonstrated significant benefits of combining home-based resistance exercise (HBRE) with multi-ingredient supplementation (MIS) in addressing age-related muscle loss and improving lean mass to fat ratios in older adults. In a randomized controlled trial involving sedentary men in their 70s, participants who combined resistance band training with a novel five-nutrient supplement containing whey, micellar casein, creatine, vitamin D, and omega-3 fatty acids showed remarkable improvements in their body composition. The study revealed an increase in appendicular and total lean mass, leading to enhanced lean mass to fat ratios.

Source:

Orsso et al. (2019). Low muscle mass and strength in pediatrics patients: Why should we care? Clinical Nutrition, 38(5), 2002–2015. https://doi.org/10.1016/j.clnu.2019.04.012 31031136

Nilsson et al. (2020). A Five-Ingredient Nutritional Supplement and Home-Based Resistance Exercise Improve Lean Mass and Strength in Free-Living Elderly. Nutrients, 12(8), 2391. https://doi.org/10.3390/nu12082391 32785021

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

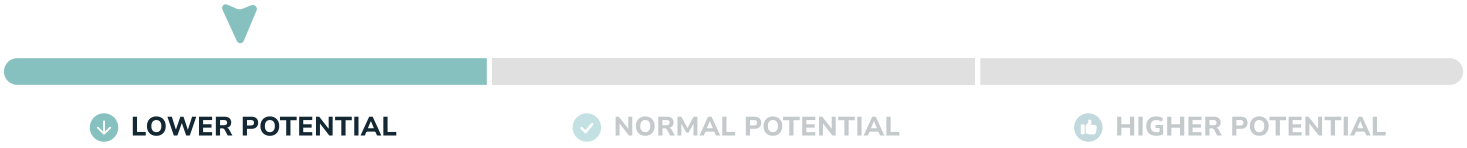
Gene	rsID	Genotype	Reference
FADS1	rs174548	CC	2 PMID: 22960237
FADS1	rs174549	GG	2 PMID: 22960237
TRHR	rs7832552	CT	2 PMID: 19268274
FTO	rs9939609	AA	1 PMID: 26888713
ADCY3	rs10182181	AA	1 PMID: 29921800
ADRB2	rs1042714	GC	1 PMID: 26888112
ADRB3	rs4994	AG	1 PMID: 26888112
FTO	rs9936385	CC	2 PMID: 28724990

Fitness - Athletic Performance

Power and Strength Potential

Muscle strength (the force from muscle contractions) and muscle power (force multiplied by speed) play vital roles in health, everyday activities, and sports performance. Research has consistently found that people with lower muscle strength face higher risks of death from various causes, as well as increased chances of developing conditions like type 2 diabetes, heart disease, osteoarthritis, and cancer. In sports science research, scientists measure different aspects of muscle strength to evaluate athletes' fitness levels, track improvements from training programs, and understand how physical activity affects the body. Common measurements include how much torque (rotational force) someone can generate at their knee or elbow joints, how much weight they can lift one time (one-rep maximum), how strongly they can grip, and how well they can jump. These tests have revealed that individuals naturally vary in their muscle strength, both before training and in how they respond to physical activity programs.

About your result



Your genetic profile suggests a more modest potential for developing power and strength.

Our Recommendations

Exercise

PERSONALIZE RECOMMENDATION

Consider adopting resistance training into your fitness routine as this can lead to noticeable gains in power. Incorporating power and strength exercises, such as weight lifting, into your fitness routine can significantly enhance your overall performance and capacity. These exercises help build muscle mass, increase strength, and improve functional movements.

Developing muscular strength through resistance training (e.g., squats, push-ups, chin-ups and weightlifting) is a fundamental component for achieving peak athletic performance across all sports. The ability to generate explosive power, a key benefit of strength training, is particularly crucial in both individual and/or team sports. To maximize strength gains, focus can be applied on these four key factors: mastering proper exercise techniques and contraction patterns, utilizing advanced training equipment and technology, optimizing nutritional intake, and working with individual's genetic potential. By incorporating regular strength training into the routine, athletic capabilities and overall performance can be enhanced.

High-resistance inspiratory muscle strength training (IMST) represents an efficient and focused form of breathing exercise designed to enhance respiratory muscle performance. Research has demonstrated that when healthy middle-aged and older adults performed this training for six weeks, completing 30 breaths daily for six days each week, they experienced improved exercise endurance, as evidenced by longer treadmill performance times. Notably, these improvements in exercise tolerance occurred without any significant changes in overall cardiorespiratory fitness levels.

To optimize maximal strength, training should prioritize the "strength zone," using heavy loads for 1 to 5 repetitions per set, corresponding to 80-100% of one's 1-repetition maximum (1RM). This protocol enhances neuromuscular adaptations, and due to the principle of specificity, strength gains are greatest on the specific exercises trained, such as squats or the bench press. Practically, this involves performing multiple sets of these core multi-joint movements within the 1-5 repetition range to maximize force production. While heavy loading is superior for peak strength, significant gains are also possible with lighter loads in moderate (8-12) or high (15+) repetition ranges, which can complement a strength-focused program. For experienced lifters, consistent training with near-maximal loads becomes progressively more important to continue advancing strength potential.

Source:

Melián Ortiz et al. (2021). Muscle Work and Its Relationship with ACE and ACTN3 Polymorphisms Are Associated with the Improvement of Explosive Strength. Genes, 12(8), 1177. https://doi.org/10.3390/genes12081177 34440352

Craighead et al. (2023). Time-Efficient, High-Resistance Inspiratory Muscle Strength Training Increases Exercise Tolerance in Midlife and Older Adults. Medicine & Science in Sports & Exercise, 56(2), 266–276. https://doi.org/10.1249/mss.0000000000003291 37707508

Behm, D. G., et al. (2017). Effectiveness of traditional strength vs. Power training on muscle strength, power and speed with youth: A systematic review and meta-analysis. Frontiers in Physiology, 8, 423. https://doi.org/10.3389/fphys.2017.00423 28713281

Dietary

PERSONALIZE RECOMMENDATION

Consider adopting a healthy diet rich in nutrients as it supports muscle growth, recovery, and overall performance. Staying hydrated and incorporating a variety of whole foods can further optimize your strength training results.

Research demonstrates that long-term supplementation with hydroxymethylbutyrate (HMB) free acid taken during resistance exercise training (e.g., squats, push-ups, chin-ups and weightlifting) produces beneficial effects on lean muscle development compared to placebo treatments. This enhanced muscle growth is attributed to the supplement's ability to stimulate increased muscle protein synthesis, particularly during the initial two weeks of resistance training, leading to greater gains in thigh muscle mass.

Protein is essential for muscle growth, recovery, and overall health. Several studies have demonstrated that ~20g of high quality protein (egg white protein or whey protein) following resistance exercise with a small amount of muscle mass (single leg training) is sufficient to maximally stimulate muscle protein synthesis in the trained leg. Dairy-based proteins (e.g., whey, milk) are particularly effective due to their leucine as well as calcium content. Emerging research on bioactive peptides suggests further benefits beyond muscle repair, highlighting the importance of optimizing protein sources and intake for both performance and health.

Dietary supplements can enhance exercise performance, recovery, and health when used strategically and safely. Caffeine, carbohydrate gels/drinks, beta-alanine, and beetroot juice are effective for endurance training; creatine and protein can support strength training and muscle growth; and probiotics, electrolytes, and vitamin D promote overall health. Always prioritize a "food first" approach and choose high-quality, independently tested products to minimize risks and maximize benefits.

Dietary fat serves as a vital component for exercise performance and recovery, functioning as both an energy reservoir and hormone regulator. While unsaturated fatty acids, particularly omega-3s, offer specific benefits including reduced inflammation, enhanced muscle recovery, and improved nervous system function, proper timing of fat consumption is crucial. For weightlifters, a recommendation of 30-40% of total caloric intake from fat is suggested, though it's important to avoid heavy fat consumption immediately before or after training due to its slow digestion rate. The focus should be on incorporating more unsaturated fats over saturated fats to minimize long-term inflammation and support overall health.

Source:

Din et al. (2019). A double-blind placebo controlled trial into the impacts of HMB supplementation and exercise on free-living muscle protein synthesis, muscle mass and function, in older adults. Clinical Nutrition, 38(5), 2071–2078. https://doi.org/10.1016/j.clnu.2018.09.025 30360984

Close et al. (2016). New strategies in sport nutrition to increase exercise performance. Free Radical Biology and Medicine, 98, 144–158. https://doi.org/10.1016/j.freeradbiomed.2016.01.016 26855422

Close et al. (2016). New strategies in sport nutrition to increase exercise performance. Free Radical Biology and Medicine, 98, 144–158. https://doi.org/10.1016/j.freeradbiomed.2016.01.016 26855422

Hwang et al. (2024). Nutritional Strategies for Enhancing Performance and Training Adaptation in Weightlifters. International Journal of Molecular Sciences, 26(1), 240. https://doi.org/10.3390/ijms26010240 39796095

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
ACTN3	rs1815739	TT	1 PMID: 12879365
CPNE5	rs3213537	CT	3 PMID: 33059329
ADORA2A	rs5751876	CT	3 PMID: 38931158

Fitness - Athletic Performance

Physical Activity and Heart Rate

The response of the heart rate to physical activity provides valuable insights into cardiac health and function. This response reflects a complex interplay of genetic and physiological factors. Heart rate naturally increases during physical activity, and how quickly it recovers afterward is an important indicator of cardiovascular health. Research has shown that impaired heart rate responses—either inadequate increases during physical activity or slow recoveries afterward—can predict an increased risk of death and cardiac events in both healthy individuals and those with heart conditions. Regular endurance training positively influences these responses by enhancing the parasympathetic nervous system's control over heart rate. As a result, beneficial adaptations may occur, such as a lower resting heart rate and faster recovery after physical activity. Genetic studies have revealed that inherited factors strongly influence both immediate and long-term heart rate responses to physical activity. Advances in genomic research allow scientists to investigate the specific genetic variations that cause differences in how people's hearts respond to physical activity. This research could lead to more personalized approaches to prescribing physical activity and managing cardiac health.

About your result

Your genetic profile indicates your heart rate may increase more significantly or be more sensitive in response to physical activity.

Our Recommendations

Monitoring

PERSONALIZE RECOMMENDATION

With your potential for a highly efficient heart rate response, regularly monitoring your heart rate during physical activity is important for optimizing your training and tracking fitness improvements. Keeping track of your heart rate helps you stay within a healthy range and reduce the risk of serious complications.

Heart Rate Recovery (HRR), the decline in heart rate after exercise cessation, is an established predictor of all-cause and cardiovascular mortality. While traditionally assessed at one minute post-exercise, a large-scale study has provided novel evidence that HRR measured at 10 seconds is a significantly stronger and superior predictor. This enhanced predictive value is thought to better reflect the rapid reactivation of the parasympathetic nervous system, a key component of autonomic health that is most active immediately after exercise. This observation has important implications for the clinical interpretation of formal exercise tests, offering a more sensitive marker of an individual's risk profile. Given the increasing accuracy of modern wearable devices, monitoring this immediate 10-second HRR is also becoming a more accessible and valuable tool for personal health awareness.

Heart Rate Variability (HRV), which measures the variation in time between consecutive heartbeats, is a key biomarker reflecting autonomic nervous system balance and overall fitness. A higher HRV generally indicates a state of good recovery, whereas a consistently low HRV can signal physiological stress, fatigue, or overtraining. While smartwatches with optical sensors offer convenient monitoring, their accuracy can be compromised by motion as they estimate HRV from blood volume changes in the wrist. In contrast, chest-strap monitors use electrocardiogram (ECG) sensors to directly measure the heart's electrical impulses, allowing for a highly accurate calculation of the precise time between beats (R-R intervals). This superior precision is why athletes and individuals seeking high-fidelity data for detailed training, recovery, and cardiovascular risk analysis often prefer chest straps over wrist-based optical devices.

A well-established benefit of regular physical activity is a lower resting heart rate (RHR), a general indicator of good cardiovascular fitness for individuals at all levels. However, it is important to note that a paradoxical increase in the risk of atrial fibrillation (AF) has been observed, though this concern is primarily associated with years of sustained, high-volume endurance training, particularly in elite male athletes. This risk is linked to significant structural changes in the heart, such as atrial enlargement, that can develop in response to the demands of extreme, prolonged exercise. For most people, the profound cardiovascular benefits of consistent, moderate exercise far outweigh this specific risk, which is largely confined to the highest levels of athletic training. Nevertheless, active individuals should monitor for any unusual heart rhythms and consult a healthcare professional with any concerns, especially when undertaking very intensive training programs.

Source:

van de Vegte et al. (2018). Heart Rate Recovery 10 Seconds After Cessation of Exercise Predicts Death. Journal of the American Heart Association, 7(8). https://doi.org/10.1161/jaha.117.008341 29622586

Turcu, A., et al. (2023). The impact of heart rate variability monitoring on preventing severe cardiovascular events. Diagnostics, 13(14), 2382. https://doi.org/10.3390/diagnostics13142382 37510126

Nordeidet et al. (2024). Sex-specific and polygenic effects underlying resting heart rate and associated risk of cardiovascular disease. European Journal of Preventive Cardiology, 31(13), 1585–1594. https://doi.org/10.1093/eurjpc/zwae092 38437179

Exercise

PERSONALIZE RECOMMENDATION

Regular exercise and active lifestyle can enhance cardiac efficiency and lower your heart rate during physical activity. Maintain regular aerobic exercises, such as walking, running, or cycling, to strengthen the heart muscle and improve circulation. By staying active, you can boost your cardiovascular health and achieve better endurance.

Regular physical activity is essential for optimal cardiovascular health. Exercise enhances cardiac efficiency, enabling the heart to achieve the same physiological output with reduced exertion. This improved efficiency manifests as a lower heart rate during both rest and physical activity. Individuals who maintain consistent exercise routines demonstrate superior cardiovascular performance compared to sedentary individuals, can accomplish equivalent tasks with less strain on the heart. This enhanced cardiac efficiency, combined with other physiological benefits such as improved blood pressure regulation and cholesterol profile optimization, significantly reduces the risk of cardiovascular disease and mortality. The heart's adaptation to regular exercise represents a fundamental mechanism through which physical activity promotes long-term cardiovascular health.

Research indicates that older rowers maintain similar VO2max levels as younger rowers who achieve comparable 2000m rowing times, suggesting that continuing to row regularly into older age helps aging-related decline in aerobic fitness. Older rowers also shown to have higher maximum heart rates compared to their non-rowing peers, indicating that regular rowing helps reduce the typical age-related decrease in maximum heart rate. Regular rowing also stimulates adaptation of the heart, with older rowers showing increased heart muscle size compared to sedentary individuals of the same age. Furthermore, maintaining rowing activity into advanced age helps preserve cardiovascular function, particularly enhancing systolic function. These beneficial adaptations can be observed after just one month of training.

Source:

Rankinen et al. (2010). CREB1 Is a Strong Genetic Predictor of the Variation in Exercise Heart Rate Response to Regular Exercise. Circulation: Cardiovascular Genetics, 3(3), 294–299. https://doi.org/10.1161/circgenetics.109.925644 20407090

Volianitis et al. (2020). The physiology of rowing with perspective on training and health. European Journal of Applied Physiology, 120(9), 1943–1963. https://doi.org/10.1007/s00421-020-04429-y 32627051

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
CCDC141	rs17362588	GA	1 PMID: 29497042
CCDC141	rs10497529	GG	1 PMID: 29769521
SNCAP1	rs4836027	TC	1 PMID: 29497042
BCL11A	rs1372876	AC	2 PMID: 29769521
SCN10A	rs6795970	AG	2 PMID: 29769521
MED13L	rs11067773	TT	2 PMID: 29769521

Fitness - Athletic Performance

VO2Max Capacity

Maximal oxygen uptake (VO2 max) is the primary metric used to evaluate endurance performance. It represents the highest rate at which an individual can utilize oxygen during strenuous physical activity. Measured in milliliters of oxygen consumed per kilogram of body weight per minute (mL/kg/min), VO2max effectively captures aerobic fitness levels and plays a crucial role in determining endurance capabilities. Higher VO2max values indicate improved efficiency in the oxygen delivery system, from respiration to muscular utilization, ultimately supporting more effective aerobic energy production. VO2 max assessment typically involves progressive intensity tests on specialized equipment, such as treadmills or cycle ergometers, which continue until the participant reaches exhaustion. Among high-level endurance athletes, VO2 max functions to indicate performance and to determine training methods that will produce optimal results.

About your result

LOWER POTENTIAL | NORMAL POTENTIAL | HIGHER POTENTIAL

Your genetic profile suggests a more modest potential for VO2max capacity, indicating that improvements may be more gradual.

Our Recommendations

Exercise

PERSONALIZE RECOMMENDATION

Consider adopting an active lifestyle and engaging in regular physical activity to help you improve your VO2 max capacity. Incorporating aerobic and endurance exercises, such as running, swimming, or cycling, into your routine can significantly boost your VO2 max capacity. These activities enhance your body's ability to utilize oxygen efficiently.

Endurance training (ET), high-intensity interval training (HIT), and sprint interval training (SIT) all resulted in similar overall increases in VO2max. However, HIT tended to show slightly greater improvements than the other two methods, while SIT yielded the largest VO2max gain relative to the amount of time spent exercising. In terms of adaptation timing, SIT boosts mitochondrial content and VO2max effectively early on, whereas ET and HIT start slower but produce steady improvements over more weeks of training. Additionally, higher training frequencies clearly led to better VO2max results (6 sessions/week > 4 sessions/week > 2 sessions/week).

Research shows that individuals respond differently to identical training programs. Some studies have found that both high-intensity interval training (HIIT) and classical endurance training produce similar average improvements in VO2 max. Even so, other studies have indicated that HIIT protocols lead to slightly greater increases in VO2max, particularly among people with cardiometabolic conditions and those participating in cardiac rehabilitation programs.

Research indicates that older rowers maintain similar VO2max levels as younger rowers who achieve comparable 2000m rowing times, suggesting that continuing to row regularly into older age helps aging-related decline in aerobic fitness. Older rowers also shown to have higher maximum heart rates compared to their non-rowing peers, indicating that regular rowing helps reduce the typical age-related decrease in maximum heart rate. Regular rowing also stimulates adaptation of the heart, with older rowers showing increased heart muscle size compared to sedentary individuals of the same age. Furthermore, maintaining rowing activity into advanced age helps preserve cardiovascular function, particularly enhancing systolic function. These beneficial adaptations can be observed after just one month of training.

Research with rowers has shown that high-intensity interval training (HIIT) led to better performance in 2000m time trials compared to long slow distance training (LSD). Beyond being more time-efficient, eight weeks of HIIT also resulted in greater enhancements to aerobic fitness measures, including VO2max.

Source:

Mølmen et al. (2024). Effects of Exercise Training on Mitochondrial and Capillary Growth in Human Skeletal Muscle: A Systematic Review and Meta-Regression. Sports Medicine, 55(1), 115–144. https://doi.org/10.1007/s40279-024-02120-2 39390310

Hoppeler et al. (2018). Deciphering Deciphering VO2max: limits of the genetic approach. Journal of Experimental Biology, 221(21). https://doi.org/10.1242/jeb.164327 30381476

Volianitis et al. (2020). The physiology of rowing with perspective on training and health. European Journal of Applied Physiology, 120(9), 1943–1963. https://doi.org/10.1007/s00421-020-04429-y 32627051

Ní Chéilleachair et al. (2016). HIIT enhances endurance performance and aerobic characteristics more than high-volume training in trained rowers. Journal of Sports Sciences, 35(11), 1052–1058. https://doi.org/10.1080/02640414.2016.1209539 27438378

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

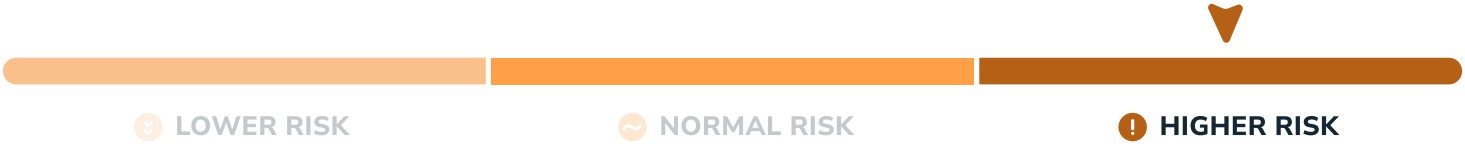
Gene	rsID	Genotype	Reference
ACTN3	rs1815739	TT	1 PMID: 26107372
NFIA-AS2	rs1572312	GG	3 PMID: 25729143
ACSL1	rs6552828	GG	1 PMID: 21183627
HFE	rs1799945	CC	3 PMID: 31970519
PPARD	rs2267668	GA	1 PMID: 29762540

Fitness - Injury Risk

Ligament Injury Risk

Ligament injury risk indicates your susceptibility to injuries affecting ligaments, the strong tissues that connects bones and stabilizes joints. A prominent example is the Anterior Cruciate Ligament (ACL) rupture, a common knee injury, particularly among active individuals. Globally, ACL ruptures account for a significant proportion of knee injuries, with an annual incidence of approximately 70 cases per 100,000 people. Such injuries frequently occur during sports involving sudden directional changes, like soccer, badminton, or basketball, where the knee undergoes twisting motions or direct impacts that overstretch or tear the ligament. While environmental factors and training play a role, genetics significantly influence susceptibility to injuries. Twin studies indicate that ACL rupture heritability is around 69%, underscoring the strong genetic component in ligament strength and injury risk. By understanding the risks associated with sports activities and their genetic predisposition, individuals can adopt informed strategies to mitigate their susceptibility to injuries and prevent ligament damage.

About your result



Your genetic profile indicate an increased risk of developing ligament injury.

Our Recommendations

Exercise

PERSONALIZE RECOMMENDATION

To prevent ligament injury, consider adopting a well-rounded exercise program which focus on strength training, plyometrics, agility exercise, and flexibility exercise.

For ligament injury prevention, especially ACL injuries, research suggests programs that include both neuromuscular training and strength training may be beneficial, particularly when started at a young age. Effective prevention programs typically combine various exercise types such as plyometrics, neuromuscular training, and strength training. Programs that integrate strengthening exercises with neuromuscular training have shown especially good results. Studies indicate that including a variety of exercises across these categories may reduce injury risk more effectively than programs that focus on just one type of exercise. A comprehensive approach to preventing ligament injuries should therefore consider including these different training methods. Proper form and technique during exercises is crucial for minimizing risk, as faulty mechanics like knee valgus (knees collapsing inward) can place increased strain on the ACL during athletic movements.

Source:

Nessler et al. (2017). ACL Injury Prevention: What Does Research Tell Us? Current Reviews in Musculoskeletal Medicine, 10(3), 281–288. https://doi.org/10.1007/s12178-017-9416-5 28656531

Dietary

PERSONALIZE RECOMMENDATION

Improve ligament health and reduce the risk of ACL injury by adopting a nutrient-rich diet that includes protein, vitamin C, vitamin D, zinc, omega-3s, and collagen-rich foods.

Adequate protein intake is foundational for ligament, supporting tissue repair and collagen production, with a suggested target of approximately 2.3 grams per kilogram of body weight daily. To further increase collagen synthesis, especially around training, consider incorporating gelatin, around 15 grams an hour before targeted exercise. Key micronutrients also play a crucial role: Vitamin C is essential for collagen cross-linking, while zinc, sulfur-containing amino acids, and beta-carotene further support collagen production. Additionally, ensure sufficient Vitamin D and calcium for ligament and bone strength, and consider Omega-3 fatty acids for their potential anti-inflammatory effects. Maintaining sufficient overall calorie intake to meet energy demands for training and recovery is equally important for ligament tissue maintenance and repair.

Source:

Nyland et al. (2022). ACL microtrauma: healing through nutrition, modified sports training, and increased recovery time. Journal of Experimental Orthopaedics, 9(1). Portico. https://doi.org/10.1186/s40634-022-00561-0 36515744

Monitoring

PERSONALIZE RECOMMENDATION

Given your increased ligament injury risk, closely monitor any pain during training sessions, especially in the ACL region, and promptly adjust your technique to prevent injury. Maintain good form and incorporate feedback from coach.

Research indicates that consistent participation in ACL injury prevention programs requires regular, shorter training sessions of 20-30 minutes multiple times weekly throughout the sports season. External feedback during training sessions helps correct exercise form by focusing on movement outcomes rather than specific body positions. Dynamic assessments can identify and correct risky movement patterns, particularly when athletes are in a fatigued state. Regular self-monitoring of balance, knee stability, and movement quality during exercise helps maintain proper biomechanics for long-term joint health.

Source:

Padua et al. (2018). National Athletic Trainers' Association Position Statement: Prevention of Anterior Cruciate Ligament Injury. Journal of Athletic Training, 53(1), 5–19. https://doi.org/10.4085/1062-6050-99-16 29314903

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
COL1A1	rs1800012	CC	1 PMID: 19193663
COL5A1	rs12722	CT	2 PMID: 34821541
COL12A1	rs970547	TT	3 PMID: 32239963
COL3A1	rs1800255	GA	1 PMID: 25073002
VEGFA	rs2010963	GG	1 PMID: 30899133
VEGFA	rs699947	AA	1 PMID: 33344666
FGB	rs1800788	TC	2 PMID: 32239963

Fitness - Injury Risk

Tendon Injury Risk

Tendon injury risk reflects an individual's likelihood of experiencing damage to tendons, a fibrous connective tissue that attaches muscle to bone. These injuries range from acute ruptures caused by sudden stress to chronic tendinopathies caused by overuse. While tendon disorders are common, specific types may vary. For example, ruptures of the Achilles tendon are common among active men aged 30–49 (often during sports activities), while issues with the rotator cuff become more prevalent with age. Flexor tendon injuries, on the other hand, are more prevalent among younger working males. Risk factors include external factors such as activity level, age, and specific sports or occupations, as well as intrinsic predispositions. Recent studies have revealed a genetic component, suggesting that genes such as BMP4, FCRL3, and COL5A1 may influence tendon integrity and susceptibility to injury. Understanding both activity-related risks and genetic factors allows individuals to adopt informed strategies to mitigate tendon damage.

About your result

LOWER POTENTIAL | NORMAL POTENTIAL | HIGHER POTENTIAL

Your genetic profile indicates a decreased risk of developing tendon injuries.

Our Recommendations

Exercise

PERSONALIZE RECOMMENDATION

Even with your lower risk profile, include balance-focused exercises in your fitness regimen to maintain tendon health and further minimize your risk of patellar and Achilles tendinopathy.

In the context of tendinopathy prevention and exercise, some studies have investigated the effects of different interventions. Research has indicated that long-term interventions incorporating balance training may have a preventive effect on patellar and Achilles tendinopathy. It has been noted that stretching as a sole intervention has not demonstrated a positive effect in preventing tendinopathy and might even increase the risk of injury in certain situations. Therefore, exercise approaches for tendinopathy prevention might consider the inclusion of balance exercises over extended periods, while the role of stretching remains uncertain. A comprehensive approach that considers load management is also relevant in the context of exercise and tendon health.

Source:

Peters et al. (2016). Preventive interventions for tendinopathy: A systematic review. Journal of Science and Medicine in Sport, 19(3), 205–211. https://doi.org/10.1016/j.jsams.2015.03.008 25981200

Dietary

PERSONALIZE RECOMMENDATION

To maintain tendon health, focus on including collagen-rich foods and leucine-rich proteins in your diet, while keeping alcohol consumption in moderation. These habits can help support the long-term strength and integrity of your tendons.

Research suggests dietary factors may play a role in tendon health. Collagen-derived peptides have shown promising clinical implications in studies, potentially supporting tendon structure due to collagen's role in tendon composition and integrity. Similarly, early research suggests leucine-rich whey protein may augment tendon adaptation during exercise, potentially aiding tendon resilience. Therefore, incorporating collagen-rich foods, considering collagen supplements, and ensuring sufficient protein intake with leucine-rich sources could be dietary measures to support tendon health. It's also worth noting that some studies suggest a link between excessive alcohol intake and tendon issues, indicating moderation of alcohol intake is necessary.

Source:

Hijlkema et al. (2022). The impact of nutrition on tendon health and tendinopathy: a systematic review. Journal of the International Society of Sports Nutrition, 19(1), 474–504. https://doi.org/10.1080/15502783.2022.2104130 35937777

Monitoring

PERSONALIZE RECOMMENDATION

Despite your lower risk of tendon injury, watch for tendon discomfort in your Achilles, knees, hips, groin, shoulders, and elbows, especially pain that worsens with physical activity or morning stiffness.

Research indicates monitoring tendon health involves attentiveness to discomfort in the Achilles, knees, hips, groin, shoulders, and elbows, particularly pain that intensifies during activity or causes morning stiffness. Tendinopathy is characterized by pain and dysfunction that can become chronic and difficult to treat, with management typically including relative rest and controlled loading. Changes in tendon loading patterns, such as significant modifications to exercise routines, are known risk factors for developing tendon problems. Persistent or worsening pain warrants consultation with healthcare professionals for proper diagnosis and management strategies. The development of tendinopathy is multifactorial, potentially influenced by demographic, anthropometric, sports-related, and strength/flexibility factors.

Source:

Peters et al. (2016). Preventive interventions for tendinopathy: A systematic review. Journal of Science and Medicine in Sport, 19(3), 205–211. https://doi.org/10.1016/j.jsams.2015.03.008 25981200

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
BMP4	rs2761884	GG	1 PMID: 24661680
FCRL3	rs7528684	AA	1 PMID: 30021560
COL1A1	rs1800012	CC	3 PMID: 34356072
COL5A1	rs12722	CT	3 PMID: 34633711

Fitness - Injury Risk

Joint and Soft Tissue Injury Risk

Joint and cartilage injury risk reflects an individual's susceptibility to damage in joints and cartilage. Knee osteoarthritis (KOA) is a common condition that affects older adults. It is caused by cartilage degeneration, inflammation, and genetic factors. The risk of developing KOA increases with age, higher body weight, and mechanical stress. Genes such as ACAN and GDF5 also influence cartilage integrity and injury susceptibility. KOA symptoms, such as pain and stiffness, significantly impair mobility and quality of life. While treatments can alleviate discomfort, KOA has no cure. These injuries are often associated with repetitive strain or high-impact activities, though genetic predisposition also plays a significant role. Understanding lifestyle risks (e.g., activity type and weight management) and genetic factors enables individuals to adopt targeted strategies that can slow disease progression, mitigate cartilage damage, and preserve joint function.

About your result

LOWER POTENTIAL NORMAL POTENTIAL HIGHER POTENTIAL

Your genetic profile indicates a decreased risk of developing joint and cartilage injuries.

Our Recommendations

Exercise

PERSONALIZE RECOMMENDATION

Given your decreased risk of joint and cartilage injury, maintain joint health through regular aerobic and quadriceps-strengthening workouts and consistent exercise habits.

Research strongly supports regular exercise for managing and preventing joint and cartilage injury, especially osteoarthritis (OA). Daily aerobic activities, such as cycling or swimming, are beneficial for overall joint health and can aid in weight management, reducing joint stress. Specifically, incorporating daily quadriceps-strengthening exercises is recommended, as studies suggest strong quadriceps muscles offer protective effects on joint cartilage and improve joint stability. Therefore, aim for a balanced routine that includes both daily aerobic and quadriceps-focused strengthening exercises, tailored to your individual fitness level and joint comfort. Consulting a healthcare professional or physical therapist can help create a personalized and safe exercise program to maximize benefits and minimize risk of injury.

Source:

Valderrabano et al. (2011). Treatment and Prevention of Osteoarthritis through Exercise and Sports. Journal of Aging Research, 2011, 1–6. https://doi.org/10.4061/2011/374653 21188091

Monitoring

PERSONALIZE RECOMMENDATION

Even with your lower risk of joint and cartilage injury, routinely self-assess for any joint discomfort, stiffness, or mobility changes especially in knee.

Research indicates that being mindful of joint health is important for osteoarthritis (OA) awareness and proactive management. Potential OA symptoms include persistent joint pain, stiffness, decreased range of motion, or muscle weakness, which can be early signs or contribute to OA progression. When these symptoms occur, especially if they limit daily activities or exercise participation, consulting a healthcare professional is advisable for diagnosis and guidance. Individuals engaging in exercise for OA prevention or management should monitor their body's response and adjust exercise intensity to their capability, with professional advice being beneficial for tailoring an appropriate exercise plan. Consistent monitoring and early intervention can be key to managing OA symptoms and maintaining joint health.

Source:

Valderrabano et al. (2011). Treatment and Prevention of Osteoarthritis through Exercise and Sports. Journal of Aging Research, 2011, 1–6. https://doi.org/10.4061/2011/374653 21188091

Dietary

PERSONALIZE RECOMMENDATION

Even with a potentially reduced risk of osteoarthritis, you can further support your joint health by embracing a Mediterranean diet, beneficial for overall well-being and long-term joint health.

Research suggests dietary patterns can influence joint injury symptoms, especially osteoarthritis (OA). The Mediterranean diet, rich in fruits, vegetables, and healthy fats, shows promising evidence for improving pain and inflammation due to its capacity to reduce systemic inflammation and support weight management, both crucial for OA. Specific foods like strawberries and ginger may also offer benefits; strawberries are high in Vitamin C, an antioxidant and collagen-supporting nutrient, while ginger contains compounds that may reduce inflammatory markers. While more research is needed on specific whole foods, incorporating a dietary approach rich in anti-inflammatory and antioxidant components, like the Mediterranean diet, could be a helpful strategy.

Source:

Buck et al. (2023). Evidence-Based Dietary Practices to Improve Osteoarthritis Symptoms: An Umbrella Review. Nutrients, 15(13), 3050. https://doi.org/10.3390/nu15133050 37447376

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
GDF5	rs143383	GA	1 PMID: 20870806
ALDH1A2	rs4238326	CT	1 PMID: 28089900
ACAN	rs3817428	CC	3 PMID: 28742099
ACAN	rs698621	GT	3 PMID: 28742099
ACAN	rs1042630	GG	3 PMID: 28742099
ACAN	rs2351491	CT	3 PMID: 28742099

Fitness - Injury Risk

Stress Fracture Risk

Stress fracture risk indicates how likely you are to develop tiny cracks in your bones from repeated activity, especially bones in the legs and feet. These are not sudden breaks, but gradual injuries from repeated movement. Stress fractures are often happening when you suddenly increase exercise due to repetitive strain. Runners, dancers, and individuals in physically demanding jobs are particularly susceptible to stress fracture. In fact, stress fractures account for around 20% of all sports injuries. Lower limbs like tibia, metatarsals, and fibula are typical sites, but upper body fractures occur in sports like gymnastics. Key risks include rapid activity increases, poor footwear, uneven surfaces, and low physical fitness. Factors like lower bone density and vitamin D deficiency also increase susceptibility, with women facing higher general risk due to lower estrogen and higher risk of osteoporosis. Ignoring these injuries can lead to prolonged pain and activity limitations. While training and lifestyle are crucial, genetic variations influencing bone strength and remodeling also play a significant role in your individual stress fracture risk. Understanding your overall risk, including genetic predispositions, allows for personalized prevention strategies.

About your result

LOWER POTENTIAL | NORMAL POTENTIAL | HIGHER POTENTIAL

Your genetic profile indicates a decreased risk of developing a stress fracture.

Our Recommendations

Exercise

PERSONALIZE RECOMMENDATION

To maintain your lower stress fracture risk, ensure your exercise routine includes a gradual increase in intensity and a variety of activities to promote bone adaptation. Consistent rest and recovery will further support your bone health.

Stress fracture prevention centers on modifying activity levels and training programs to avoid excessive repetitive stress on bones, including preventing sudden increases in exercise intensity, duration, or frequency that can overwhelm bone remodeling capacity. A gradual progression of physical activity allows bones to adapt to increasing loads, while incorporating cross-training activities maintains cardiovascular fitness without placing repetitive stress on the same bones. Scheduling adequate rest and recovery periods between training sessions is essential as bone repair and remodeling occurs during rest phases. Insufficient recovery time can lead to microfracture accumulation that eventually develops into stress fractures. Monitoring the body's signals of fatigue and pain provides important feedback for adjusting training schedules and preventing bone injuries.

Source:
Patel, D. S., Roth, M., & Kapil, N. (2011). Stress fractures: Diagnosis, treatment, and prevention. American Family Physician, 83(1), 39–46. https://www.aafp.org/pubs/afp/issues/2011/0101/p39.html 21888126

Dietary

PERSONALIZE RECOMMENDATION

Even with your lower risk of stress fracture, continue to nourish your bones with sufficient calcium, vitamin D, and protein.

Dietary considerations for stress fracture prevention focus primarily on calcium and vitamin D intake, with research on female military recruits suggesting a potential benefit from daily supplementation of calcium (2,000 mg) and vitamin D (800 IU), although findings did not reach statistical significance in all analyses. For general bone health maintenance, which underlies stress fracture prevention, calcium intake of at least 1000mg daily provides essential building blocks for bone structure. Vitamin D, recommended at approximately 800 IU daily, plays a crucial role in calcium absorption and utilization by bone tissue. Protein consumption of roughly 1 gram per kilogram of body weight daily supports both bone matrix formation and muscle strength, indirectly benefiting skeletal integrity. While evidence specifically for stress fracture prevention remains somewhat inconclusive, ensuring adequate intake of these key nutrients represents a fundamental approach to supporting bone strength and potentially reducing fracture risk.

Source:
Patel, D. S., Roth, M., & Kapil, N. (2011). Stress fractures: Diagnosis, treatment, and prevention. American Family Physician, 83(1), 39–46. https://www.aafp.org/pubs/afp/issues/2011/0101/p39.html 21888126

Monitoring

PERSONALIZE RECOMMENDATION

Even with a lower risk, remain attentive to activity-related bone pain and consult a professional should any persistent discomfort arise.

Pay close attention to localized bone pain that develops or worsens during activity and improves with rest, as this is a key sign of potential stress fractures. Be alert to tenderness, swelling, or bruising in the lower extremities, particularly after increasing activity levels or engaging in repetitive high-impact exercises. If pain persists despite rest or recurs when resuming activity, consult a healthcare professional for an accurate diagnosis and appropriate treatment. Individuals with a history of stress fractures or pain in high-risk areas (e.g., shins, feet) should seek prompt medical attention to prevent complications.

Source:
Patel, D. S., Roth, M., & Kapil, N. (2011). Stress fractures: Diagnosis, treatment, and prevention. American Family Physician, 83(1), 39–46. https://www.aafp.org/pubs/afp/issues/2011/0101/p39.html 21888126

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
SOST	rs1877632	GG	1 PMID: 29129460
VDR	rs1544410	TT	2 PMID: 36248271
GC	rs7041	CA	1 PMID: 36248271

Fitness - Injury Risk

Fragility Fracture Risk

Fragility fracture risk represents the likelihood of developing bone fractures from low-energy traumas, such as minor falls or everyday activities. Unlike stress fractures, which result from repetitive stress on healthy bones, fragility fractures are a key indicator of osteoporosis and reduced bone strength. These fractures most often affect the hip, spine, and forearm, and they become more common after age 50. However, their prevalence varies across populations and sexes. While factors such as age, bone density, and lifestyle influence risk, genetic predisposition also plays a significant role. Current research has shown that fracture risk can be predicted more accurately than with traditional clinical factors alone. Understanding genetic and non-genetic risks is crucial for developing personalized strategies to prevent these debilitating fractures, which are particularly prevalent in older adults.

About your result

LOWER RISK NORMAL RISK **HIGHER RISK**

Your genetic profile indicates an increased risk of developing a fragility fracture.

Our Recommendations

Monitoring

PERSONALIZE RECOMMENDATION

Given your increased risk of fragility fractures, regularly monitor bone density and promptly discuss any new or persistent bone pain with your doctor.

Periodic bone mineral density (BMD) testing is recommended, especially with aging or changes in risk factors, as it helps detect early bone loss and assess fracture risk. Be mindful of new or persistent bone pain, particularly in the hips, spine, or wrists, as these may signal fractures or underlying bone issues. Regularly discuss bone health and fracture risk with a healthcare provider, particularly if there are concerns or changes in health status, to ensure timely interventions. Proactive monitoring and open communication with a doctor are essential for maintaining long-term bone health and preventing complications.

Source:

Hejazi et al. (2022). Effects of physical exercise on bone mineral density in older postmenopausal women: a systematic review and meta-analysis of randomized controlled trials. Archives of Osteoporosis, 17(1). https://doi.org/10.1007/s11657-022-01140-7 35896850

Lifestyle

PERSONALIZE RECOMMENDATION

Given your increased risk of fragility fractures, manage it with an active lifestyle, sunlight, no smoking, and limited alcohol.

A bone-healthy lifestyle involves more than exercise and diet; it also includes reducing sedentary behavior by breaking up long sitting periods with regular movement, as prolonged inactivity can weaken bones. Adequate sunlight exposure supports natural vitamin D synthesis, which is essential for calcium absorption and bone strength, when safe and appropriate for the individual. Avoiding smoking and limiting alcohol is critical, as smoking reduces bone density and alcohol interferes with bone-forming cells, both increasing fracture risk. Combining these habits with a balanced diet and physical activity creates a comprehensive approach to managing osteoporosis and reducing fracture risk effectively.

Source:

Daly et al. (2017). Exercise and nutritional approaches to prevent frail bones, falls and fractures: an update. Climacteric, 20(2), 119–124. https://doi.org/10.1080/13697137.2017.1286890 28286988

Exercise

PERSONALIZE RECOMMENDATION

Given your increased risk of fragility fractures, focus on weight-bearing and muscle-strengthening exercises, prioritizing balance and avoiding high-impact activities.

Research indicates that preventing fragility fractures through exercise involves regular participation in weight-bearing activities such as walking, dancing, or low-impact aerobics, which create mechanical signals that stimulate bone formation. Combining these with muscle-strengthening or resistance training helps build and maintain muscle strength, indirectly reducing fall risk, a major contributor to fragility fractures. Individuals with higher fracture risk should generally avoid high-impact sports and instead focus on exercises that improve balance, posture, gait, and coordination, such as yoga or pilates. Establishing physical activity as a lifelong habit, beginning at a young age, contributes to maximizing peak bone mass and maintaining bone health throughout life, thereby reducing fragility fracture likelihood in later years.

Source:

Rondanelli et al. (2021). Nutrition, Physical Activity, and Dietary Supplementation to Prevent Bone Mineral Density Loss: A Food Pyramid. Nutrients, 14(1), 74. https://doi.org/10.3390/nu14010074 35010952

Dietary

PERSONALIZE RECOMMENDATION

Given your increased risk of fragility fracture, prioritize bone health by richly including dairy, fruits, vegetables, whole grains, oily fish, and protein in your diet, and consider supplements if needed.

A bone-healthy diet includes 3 servings of whole grains for fiber linked to better bone density, 5 servings of fruits and vegetables (especially beta-carotene-rich options like oranges and spinach) for their protective effects against bone loss, and daily dairy (e.g., 125 mL yogurt, 200 mL skim milk) for calcium, the primary building block of bones. Incorporate healthy fats (e.g., 1.5 tbsp olive oil) for polyphenols that may reduce bone breakdown, 4 weekly portions of oily fish for omega-3s that support bone mass, and protein sources like chicken, legumes, eggs, and cheese to maintain bone matrix and muscle strength. Limit processed and red meats to once a week, and reduce salt, sugar, and phosphate additives, as high sodium increases calcium loss, and excess phosphorus can harm bone structure. If dietary intake is insufficient, consider supplements like calcium and vitamin D for bone strength, omega-3s for anti-inflammatory benefits, boron for bone metabolism, and isoflavones for their potential to improve bone density and reduce fracture risk.

Source:

Rondanelli et al. (2021). Nutrition, Physical Activity, and Dietary Supplementation to Prevent Bone Mineral Density Loss: A Food Pyramid. Nutrients, 14(1), 74. https://doi.org/10.3390/nu14010074 35010952

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

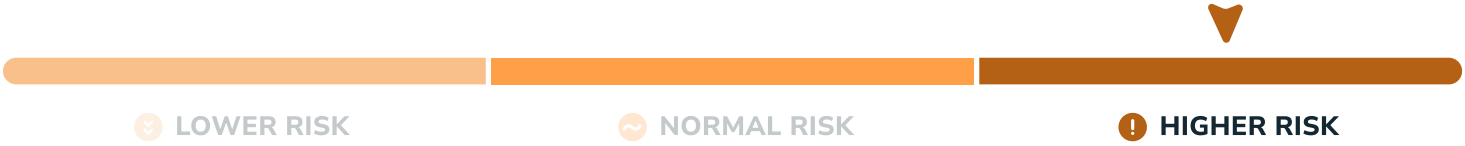
Gene	rsID	Genotype	Reference
TNFRSF11B	rs4355801	GA	1 PMID: 18455228
LRP5	rs3736228	CT	1 PMID: 22504420
SOST	rs1513670	CC	1 PMID: 19079262
TNFRSF11A	rs3018362	AG	1 PMID: 19079262
SP7	rs10876432	GG	1 PMID: 19079262
LRP5	rs2306862	CT	1 PMID: 14727154
MEPE/SPP1	rs6532023	TG	1 PMID: 22504420
C17orf53	rs227584	AC	1 PMID: 27965945
FAM210A	rs4796995	AA	1 PMID: 22504420
SPTBN1	rs4233949	CG	1 PMID: 22504420
SLC25A13	rs4727338	CG	1 PMID: 22504420
WNT16	rs3801387	AG	1 PMID: 27965945
FOXL1	rs10048146	AA	1 PMID: 27965945
AKAP11	rs9533090	CC	1 PMID: 27965945
ARHGAP1	rs7932354	CC	1 PMID: 27965945

Fitness - Muscle Property

Muscle Damage Risk

Muscle damage risk refers to an individual's susceptibility to injuries affecting skeletal muscle, which can range from microscopic fiber tears to complete ruptures. These injuries can be categorized as indirect, caused by overstretching or intense eccentric contractions (common in sports like sprinting or weightlifting), or direct, resulting from an impact such as a contusion (bruise) or a laceration. The severity of muscle damage is often classified in grades: Grade I (mild) involves a few damaged fibers with minor discomfort, while Grade III (severe) constitutes a complete muscle rupture with significant pain, hematoma, and loss of function, requiring long-term rehabilitation. Following muscle damage, particularly from intense exercise, common physiological indicators include inflammation, delayed-onset muscle soreness (DOMS), and the release of muscle proteins like creatine kinase (CK) into the bloodstream. An individual's risk is influenced by the type of muscle (e.g., muscles that cross two joints, like the hamstrings, are more vulnerable), the specific activity, and intrinsic biological factors that govern the complex healing process of destruction, repair, and remodeling.

About your result



Your genetic profile indicates an increased susceptibility to muscle damage from exercise, potentially leading to more significant soreness or longer recovery.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

Maintain a well-balanced and healthy nutritional diet to minimize the risk of muscle damage associated with intense physical activity. Furthermore, incorporating supplementations is also beneficial for muscle health and post-exercise recovery.

Supplementation of 2,400 mg of fish oil daily for four weeks (providing 600 mg EPA and 260 mg DHA) appeared to protect muscle fibers from damage, as indicated by reduced levels of creatine kinase. This fish oil intake also lessened the decrease in elbow joint flexibility that typically occurs after 60 eccentric muscle contractions.

During extended bouts of high-intensity exercise exceeding 60 minutes, both energy availability and fluid balance become critical factors. Therefore, carbohydrate consumption is advised at a rate of approximately 30–60 grams per hour. Ideally, carbohydrate intake is taken via a 6–8% carbohydrate-electrolyte drink, with a volume of 6–12 fluid ounces (~170-350 ml) consumed every 10–15 minutes throughout the exercise session, particularly for sessions lasting beyond 70 minutes. In situations where carbohydrate delivery is insufficient, the inclusion of protein may be beneficial in enhancing performance, mitigating muscle damage, promoting euglycemia (normal blood glucose levels), and facilitating muscle glycogen re-synthesis.

A study demonstrated that protein supplementation can help reduce markers of muscle damage and soreness during recovery from exercise. Specifically, the study found that levels of creatine kinase (CK) in the blood and reports of delayed onset muscle soreness (DOMS) were both significantly lower in the group taking protein compared to a placebo group. The researchers suggest that protein may work by preventing a decrease in proteasome activity, reducing oxidative stress, and changing the activity of inflammation-related pathway. Ultimately, these findings suggest that protein could be a useful nutritional strategy to improve muscle repair and maintain muscle function, especially when exercise causes increased inflammation in the muscles.

To minimize the IL-6 inflammatory response after exercise, it is recommended to consume sufficient calories and carbohydrates beforehand to match the energy requirement and optimized glycogen levels. Other nutritional interventions, such as Omega-3 and vitamin supplements, can also be beneficial to mitigate tissue injury and/or promote faster healing process after exercise.

Exercise-induced muscle damage can be mitigated through antioxidant supplementation. Supplementing with antioxidants reduces exercise-related pro-inflammatory markers and fat oxidation. Consequently, older individuals taking antioxidant and/or omega-3 PUFA supplements demonstrate enhanced exercise response and reduced muscle damage.

Supplementation with melatonin shows potential as a sports aid for regulating inflammatory responses and reducing muscle injury, potentially improving athletes' overall health and performance capabilities. Administration of melatonin demonstrated noteworthy decreases or trending reductions in muscle damage biomarkers such as creatine kinase and lactate dehydrogenase. This protective effect on muscle tissue may be attributed to melatonin's antioxidant properties. Consult with your physician regarding taking melatonin as a supplement and to determined the proper safe dosage.

Research indicates that branched chain amino acids (BCAAs) supplementation, whether started just before exercise or up to 12 days prior, can lead to lower levels of blood indicators associated with muscle damage post-exercise. Specifically, markers such as creatine kinase, ammonia, lactate dehydrogenase, and myoglobin are reduced. This improved biochemical profile is connected to better muscle function recovery and reduced muscle soreness following demanding exercises like repeated drop jumps and maximal resistance training.

Creatine has been suggested for use as a recovery aid in cases where large muscle damage occurs. For individuals who respond well to creatine supplementation, a dose of roughly 20 grams daily for 8-10 days, taken both before and after exercise, is usually adequate to minimize exercise-related muscle damage and promote physical recovery. However, it's important to note that some individuals might require a longer creatine supplementation period, potentially lasting several weeks, to achieve optimal results.

Source:
Tsuchiya et al. (2021). 4-week eicosapentaenoic acid-rich fish oil supplementation partially protects muscular damage following eccentric contractions. Journal of the International Society of Sports Nutrition, 18(1). https://doi.org/10.1186/s12970-021-00411-x 33648546
Kerksick et al. (2017). International society of sports nutrition position stand: nutrient timing. Journal of the International Society of Sports Nutrition, 14(1). https://doi.org/10.1186/s12970-017-0189-4 28919842
Draganidis et al. (2017). Protein ingestion preserves proteasome activity during intense aseptic inflammation and facilitates skeletal muscle recovery in humans. British Journal of Nutrition, 118(3), 189–200. https://doi.org/10.1017/s0007114517001829 28831951
Hennigar et al. (2017). Nutritional interventions and the IL-6 response to exercise. The FASEB Journal, 31(9), 3719–3728. Portico. https://doi.org/10.1096/fj.201700080r 28507168
Pastor et al. (2020). Response to exercise in older adults who take supplements of antioxidants and/or omega-3 polyunsaturated fatty acids: A systematic review. Biochemical Pharmacology, 173, 113649. https://doi.org/10.1016/j.bcp.2019.113649 31586588
Celorrio San Miguel et al. (2024). Impact of Melatonin Supplementation on Sports Performance and Circulating Biomarkers in Highly Trained Athletes: A Systematic Review of Randomized Controlled Trials. Nutrients, 16(7), 1011. https://doi.org/10.3390/nu16071011 38613044
O'Connor et al. (2022). Nutritional Compounds to Improve Post-Exercise Recovery. Nutrients, 14(23), 5069. https://doi.org/10.3390/nu14235069 36501099
O'Connor et al. (2022). Nutritional Compounds to Improve Post-Exercise Recovery. Nutrients, 14(23), 5069. https://doi.org/10.3390/nu14235069 36501099

Monitoring

PERSONALIZE RECOMMENDATION

With your increased genetic risk for muscle damage, it is vital to monitor your recovery. Pay close attention to your subsequent strength performance before progressing your training.

Monitoring indicators of exercise-induced muscle damage (EIMD) is important when starting a new or intense training program because physiological responses can vary greatly with age. Common markers for all ages include temporary decreases in muscle strength, increased muscle soreness, and elevated blood levels of creatine kinase (CK) within 24–48 hours after exercise. However, a key age-related difference to monitor is serum myoglobin. Studies show that older adults may exhibit greater and more persistent elevations in myoglobin, suggesting that their muscle cell membranes are more vulnerable to exercise-induced damage. While these biochemical markers indicate a level of muscular stress, they do not necessarily predict slower strength recovery, which can be similar across age groups. Therefore, individuals, especially older adults, should primarily monitor their recovery through subsequent strength performance and understand that a more pronounced myoglobin response may require a more cautious progression of the training load.

Source:
Heckel, Z., et al. (2019). Monitoring exercise-induced muscle damage indicators and myoelectric activity during two weeks of knee extensor exercise training in young and old men. PLOS ONE, 14(11), e0224866. https://doi.org/10.1371/journal.pone.0224866 31697769

Lifestyle

PERSONALIZE RECOMMENDATION

Maintain a healthy lifestyle to minimize muscle damage risk and promote muscle health. Proper and sufficient rest as well as recovery techniques can help aid muscle recovery and reduce tension.

A study indicated that massage can help muscles regain their strength and improve joint position sense (JPS) following exercise-induced muscle damage (EIMD). It is suggested that the mechanical actions of massage may help muscle fibers return to a more organized arrangement. This improved muscle fiber alignment is thought to support muscle function recovery, reduce fatigue, and enhance overall performance. Furthermore, the pressure applied during massage is believed to alter the excitability of nerves, which can influence muscle tension and the likelihood of spasms or pain. Massage is commonly used as a therapeutic method to aid recovery from both muscle fatigue and injuries.

Research findings indicate that stretching muscles during maximal contraction is considerably more effective than traditional passive static stretching for producing positive and clinically significant changes in muscle properties that are commonly associated with muscle strain injury. These beneficial adaptations suggest a probable decrease in exercise-induced muscle damage (EIMD) and the likelihood of injury, alongside an enhancement in general functional performance.

Source:
Shin et al. (2015). Effects of Massage on Muscular Strength and Proprioception After Exercise-Induced Muscle Damage. Journal of Strength and

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
ACTN3	rs1815739	TT	1 PMID: 15817725
COL5A1	rs12722	CT	3 PMID: 38448778
TRIM63	rs2275950	TC	3 PMID: 29212849
AMPD1	rs17602729	GA	3 PMID: 36468031
MLCK	rs28497577	GG	3 PMID: 36468031
IL6	rs1800795	CC	3 PMID: 18758806
CKM	rs11559024	TT	2 PMID: 28790154

Fitness - Muscle Property

Muscle Recovery Impairment

People who regularly exercise or play sports face the ongoing challenge of balancing the stress of working out with adequate recovery. As training intensity and overall stress increase, the focus on recovery should also increase. Adaptation and improvement occur during recovery periods. Without sufficient recovery, individuals may have difficulty training effectively, completing their planned workouts, and reaching their performance goals. Therefore, athletes and exercise enthusiasts are encouraged to incorporate recovery techniques to manage fatigue and improve short- and long-term recovery. It's important to remember that recovery is multifaceted, encompassing psychological, physiological, emotional, and social aspects. Effective recovery strategies should address all these components to enable individuals to push their limits again effectively.

About your result

LOWER RISK NORMAL RISK **HIGHER RISK**

Your genetic profile indicates an increased predisposition to muscle recovery impairment, suggesting recovery may take longer or be less efficient.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

Maintain a well-balanced and healthy nutritional diet to optimize muscle recovery after strenuous physical activity. Furthermore, incorporating supplementations is also an effective means to hasten muscle recovery and promote overall well-being.

Fish oil n-3 polyunsaturated fatty acid (PUFA) supplementation shows probable benefits for maintaining strength and highly likely advantages for recovering from physiological challenges in young, healthy individuals. Although precise supplementation guidelines are difficult to establish, evidence indicates that consuming at least 2 g per day for at least 4 weeks is necessary to maintain strength and improve recovery following physiological stress. Although this study focused on military personnel, these results can be applied to other groups who engage in physically demanding activities, such as first responders, athletes, and individuals who regularly exercise.

To improve muscle recovery, studies indicate that a daily dose of 3 grams of hydroxymethylbutyrate (HMB), split into three servings and taken for at least 2 weeks, is generally effective. Using less HMB or for shorter durations may lead to inconsistent results. HMB is available as calcium salt (Ca-HMB) or a more bioavailable free acid gel form (HMB-FA). The HMB-FA form is absorbed faster and leads to a quicker rise in HMB blood levels.

Studies on female athletes have shown that four days of whey protein supplementation results in better muscle recovery than a calorie-matched carbohydrate supplement. This improvement was observed in better muscle function (as measured by RSI and flexibility), and was likely due to reduced muscle damage, as indicated by lower creatine kinase (CK) levels in the blood. While not directly measured in the study, researchers believe the increased amino acid supply from the WHP also sped up the repair of damaged muscle tissue and contributed to the faster recovery of muscle strength. While some may consider the observed benefits in muscle recovery to be small, the study concludes that even a modest acceleration of recovery is significant for exercising females. Thus, whey protein supplementation is an important consideration for these athletes.

Studies have shown that foods and juices rich in polyphenols, such as berries, cherries, and beetroot, may help speed up muscle recovery by up to 13% and reduce muscle soreness by up to 29% after exercise-induced muscle damage (EIMD). This degree of recovery enhancement could be advantageous for athletes, especially when competitive events are closely spaced and poor recovery could compromise performance. Polyphenol supplementation may also be beneficial when EIMD results in prolonged muscle impairment, such as after intense training or when starting a new program. Although the exact mechanism by which polyphenols improve recovery is unclear, reducing inflammation and increasing antioxidant capacity are believed to play significant roles.

High-intensity exercise can cause impairment of muscle sarcomeres and pain, which not only lower quality of life but also limit future training ability. Given these impacts, L-carnitine supplementation to promote recovery from exercise is particularly beneficial for the healthy, young, and active group. Although suggested dosages can vary depending on the specific publication, a daily intake of 1-2 grams of L-carnitine is generally the amount that has been utilized in these research.

Milk is an ideal post-exercise recovery beverage for many individuals who exercise due to its ready availability and unique nutrient profile. Consuming milk after a workout can positively influence short- and long-term recovery processes and adaptations to training. Milk aids muscle protein synthesis and rehydration after exercise. It can also contribute to restoring muscle glycogen (energy stores) and lessen muscle soreness and functional decline. In these respects, milk performs at least as well as, if not better than, most commercially available recovery drinks. Furthermore, milk is significantly less expensive than most commercial options, providing a cost-effective and convenient way to support post-exercise recovery for budget-conscious individuals. Additionally, consuming milk after exercise appears to regulate subsequent energy intake and contribute to favorable changes in body composition during training. This suggests that individuals exercising to manage their weight can recover effectively after workouts without negatively impacting their energy balance.

Source:
Heileson et al. (2020). The effect of fish oil supplementation on the promotion and preservation of lean body mass, strength, and recovery from physiological stress in young, healthy adults: a systematic review. Nutrition Reviews, 78(12), 1001–1014. https://doi.org/10.1093/nutrit/nuaa034 32483626
O'Connor et al. (2022). Nutritional Compounds to Improve Post-Exercise Recovery. Nutrients, 14(23), 5069. https://doi.org/10.3390/nu14235069 36501099
Brown et al. (2018). Whey protein hydrolysate supplementation accelerates recovery from exercise-induced muscle damage in females. Applied Physiology, Nutrition, and Metabolism, 43(4), 324–330. https://doi.org/10.1139/apnm-2017-0412 29106812
Rickards et al. (2021). Effect of Polyphenol-Rich Foods, Juices, and Concentrates on Recovery from Exercise Induced Muscle Damage: A Systematic Review and Meta-Analysis. Nutrients, 13(9), 2988. https://doi.org/10.3390/nu13092988 34578866
Fielding et al. (2018). l-Carnitine Supplementation in Recovery after Exercise. Nutrients, 10(3), 349. https://doi.org/10.3390/nu10030349 29534031
James et al. (2018). Cow's milk as a post-exercise recovery drink: implications for performance and health. European Journal of Sport Science, 19(1), 40–48. Portico. https://doi.org/10.1080/17461391.2018.1534989 30379113

Lifestyle

PERSONALIZE RECOMMENDATION

Maintain a healthy lifestyle to help hasten muscle and post-exercise recovery as well as to promote overall muscle health. Sufficient sleep is key for optimal recovery, and regular massage helps reduce muscle tension and speeds up the recovery process.

To improve hydration, muscle recovery, and sleep quality, it's helpful to consume specific nutrients before bed. Consider drinking milk or coconut water for electrolytes, eating easily digestible carbohydrates (high-glycemic) like a banana or a small portion of white rice to restore energy, and having slow-digesting proteins like Greek yogurt, cottage cheese, or a casein protein shake for muscle repair. Additionally, tart cherry juice can aid recovery, and foods containing tryptophan, such as almonds or pumpkin seeds, can promote more restful sleep. When it comes to sleep deprivation, the best solution is simply to get more sleep, but good sleep habits can improve the quality of the rest you do get. Since light has a major impact on sleep, athletes should adopt routines that follow the natural cycle of day and night and minimize light exposure from screens and lamps before bedtime.

Preliminary evidence suggests that massage may provide immunological benefits related to strenuous physical activity. Incorporating massage as a recovery method could mitigate the negative effects of intense exercise on the immune system. When applied during a warm-up, massage may also protect against immune system disturbances caused by high-intensity exertion. These effects may be due to the modulation of immune functions post-exercise. Specifically, massage may help restore immunoglobulin A (IgA) levels and decrease the concentration of pro-inflammatory mediators, which are typically elevated after intense physical activity.

Research found that a 20-minute mechanical bed massage session effectively improved recovery from back muscle fatigue induced by a reverse sit-up exercise. This conclusion is supported by measurements of biochemical markers like serum cortisol (a stress hormone) and creatine kinase (an indicator of muscle damage). The study suggests that mechanical bed massage may reduce physical or psychological stress, and it may also have a protective effect against exercise-induced damage in back muscles.

Source:
Nédélec et al. (2015). Sleep Hygiene and Recovery Strategies in Elite Soccer Players. Sports Medicine, 45(11), 1547–1559. https://doi.org/10.1007/s40279-015-0377-9 26275673
Tejero-Fernández et al. (2015). Immunological effects of massage after exercise: A systematic review. Physical Therapy in Sport, 16(2), 187–192. https://doi.org/10.1016/j.ptsp.2014.07.001 25116861
Zhong et al. (2020). Effects of mechanical bed massage on biochemical markers of exercise-induced back muscle fatigue in athletes: A randomized controlled trial. Journal of Back and Musculoskeletal Rehabilitation, 33(5), 793–800. https://doi.org/10.3233/bmr-181347 31903980

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
ACTN3	rs1815739	TT	3 PMID: 34069995

Fitness - Muscle Property

Muscle Soreness

Delayed onset muscle soreness (DOMS) is the discomfort and pain in the muscles that develops in response to eccentric muscle contractions and unaccustomed or high-intensity exercise. The soreness usually begins to increase within the first day after exercise, peaks between 24 and 72 hours later, and gradually disappears within five to seven days. The perception of pain comes from nerve endings around muscle fibers being activated by signals related to muscle damage. For athletes, DOMS can be problematic because muscle soreness can temporarily limit their ability to train or compete. For non-athletes, reducing DOMS can make exercise more enjoyable and encourage regular exercise. The main idea behind DOMS is that it is caused by short-term inflammation in response to muscle damage. Therefore, strategies that lessen muscle damage or help the body recover faster from inflammation are likely to relieve DOMS.

About your result

LOWER RISK NORMAL RISK **HIGHER RISK**

Your genetic profile indicates an increased predisposition to experiencing muscle soreness after exercise.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

Maintain a well-balanced and healthy nutritional diet to help reduce muscle soreness after exercise. Moreover, the potential benefits of incorporating appropriate supplementations into your post-exercise recovery should be considered.

Consuming EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), two types of omega-3 fatty acids found in foods such as fatty fish (e.g., salmon, mackerel, and sardines) seems to be beneficial for reducing delayed onset muscle soreness (DOMS). These compounds are known to work together to reduce soreness, especially when taken in a ratio of about 2:1 (EPA:DHA). Although different dosages were used in studies with similar results, research shows that EPA and DHA supplements effectively reduce DOMS caused by eccentric contractions. However, the efficacy of this effect may vary based on the specific dosages of EPA and DHA and the muscle groups exercised.

To maximize recovery benefits, studies indicate that consuming drinks rich in polyphenols is beneficial. For instance, a tart cherry drink providing approximately 600 mg of polyphenols (equivalent to about 30 mL of concentrate) should be consumed twice daily, starting at least three days prior to exercise. Other polyphenol-rich options, such as pomegranate juice and beetroot juice, may also support similar recovery effects. Research has shown that consuming lower amounts generally has weaker effects on post-exercise recovery. Overall, these polyphenol sources appear to be promising natural aids for individuals seeking to lessen inflammation and speed up their recovery.

Supplementation with omega-3 polyunsaturated fatty acids (PUFAs), commonly sourced from fatty fish like salmon and mackerel, algal oil, or fish oil concentrates, appears to lessen muscle soreness after exercise-induced muscle damage (EIMD). For example, one study noted a statistically significant difference in perceived muscle soreness at 24 hours post-EIMD, with the group taking omega-3s reporting less pain. This finding is consistent with other research on delayed onset muscle soreness (DOMS), which also indicates that groups receiving fish oil experience reduced muscle soreness.

Studies have shown that eating foods rich in anthocyanins, such as blackberries, blueberries, cherries, and red wine, can help muscles recover faster after exercise. These foods have been linked to reduced creatine kinase (CK) levels, less muscle soreness and strength loss, and increased power. The positive effects are believed to stem from anthocyanins' ability to reduce inflammation and increase the body's antioxidant capacity, indicating a potential cause-and-effect relationship.

Research indicates that consuming 500 ml of milk after eccentric exercise can help female athletes limit declines in muscle function, reduce increases in certain serum proteins, and lessen muscle soreness. This faster recovery is practically beneficial as it helps maximize future training and athletic performance. For male athletes, milk consumption has been shown to be beneficial in curbing the increase in muscle soreness and in markers in the blood that indicate muscle membrane disruption and muscle damage.

Cold water immersion (CWI) is a popular recovery strategy used after strenuous exercise to address delayed-onset muscle soreness (DOMS) and fatigue. A meta-analysis indicates that CWI immediately reduces subjective feelings of soreness and perceived exertion after a workout. This practice can also objectively lower biomarkers of muscle stress. For example, it reduces creatine kinase (CK) levels after 24 hours and lactate levels after 24 to 48 hours. To achieve the most effective outcome regarding muscle soreness and fatigue, CWI should be utilized immediately after completing high-intensity exercise. Notably, variations in water temperature or the body parts immersed do not significantly alter these positive recovery effects, providing flexibility.

Source:

Ochi et al. (2018). Eicosapentaenoic Acid (EPA) and Docosahexaneoic Acid (DHA) in Muscle Damage and Function. Nutrients, 10(5), 552. https://doi.org/10.3390/nu10050552 29710835

O'Connor et al. (2022). Nutritional Compounds to Improve Post-Exercise Recovery. Nutrients, 14(23), 5069. https://doi.org/10.3390/nu14235069 36501099

Kyriakidou et al. (2021). The effect of Omega-3 polyunsaturated fatty acid supplementation on exercise-induced muscle damage. Journal of the International Society of Sports Nutrition, 18(1). https://doi.org/10.1186/s12970-020-00405-1 33441158

Kimble et al. (2021). The effect of dietary anthocyanins on biochemical, physiological, and subjective exercise recovery: a systematic review and meta-analysis. Critical Reviews in Food Science and Nutrition, 63(9), 1262–1276. https://doi.org/10.1080/10408398.2021.1963208 34402657

Rankin et al. (2015). The effect of milk on the attenuation of exercise-induced muscle damage in males and females. European Journal of Applied Physiology, 115(6), 1245–1261. https://doi.org/10.1007/s00421-015-3121-0 25673557

Xiao, F., et al.(2023). Effects of cold water immersion after exercise on fatigue recovery and exercise performance—Meta analysis. Frontiers in Physiology, 14, 1006512. https://doi.org/10.3389/fphys.2023.1006512 36744038

Exercise

PERSONALIZE RECOMMENDATION

Maintain a stretching routine as part of pre-exercise preparation to help alleviate potential muscle soreness and reduce the risk of muscle injury before engaging in physical activity.

Research shows that low-intensity passive static stretching is more effective than either high-intensity passive static stretching or no stretching at all for reducing perceived muscle soreness and restoring muscle function after unaccustomed eccentric exercise. These benefits are considered small to moderate. Since soreness from delayed onset muscle soreness (DOMS) can negatively affect athletic performance, reducing this soreness could help athletes recover maximal muscle function more quickly. Additionally, experiencing less muscle soreness may encourage individuals who are not athletes to stick with their exercise routines more consistently.

Active Isolated Stretching (AIS) is a dynamic stretching method that works with the body's own reflexes to increase flexibility. The technique involves actively contracting the muscle group opposite to the one being stretched (the agonist muscle). This contraction signals the target muscle (the antagonist) to relax, a principle known as reciprocal inhibition, allowing it to be stretched more effectively. To perform an AIS stretch, an individual actively moves a limb to the point of a light stretch without any external force. The position is held for only two seconds while exhaling, which is crucial for preventing the body's protective stretch reflex from activating and causing the muscle to tighten. The limb is then returned to the starting position, and the movement is typically repeated 8-12 times, with the aim of gently increasing the range of motion with each repetition.

Source:

Apostolopoulos et al. (2018). The effects of different passive static stretching intensities on recovery from unaccustomed eccentric exercise – a randomized controlled trial. Applied Physiology, Nutrition, and Metabolism, 43(8), 806–815. https://doi.org/10.1139/apnm-2017-0841 29529387

Qamar et al. (2020). Effects of active isolated stretching on exercise-induced muscle damage in untrained subjects: A randomized controlled trial. Journal of the Pakistan Medical Association, 1–12. https://doi.org/10.47391/JPMA.494 33819216

Lifestyle

PERSONALIZE RECOMMENDATION

Maintain a healthy lifestyle to help minimize muscle soreness after exercise, further aid in reducing discomfort and promote muscle well-being. Comprehensive healthy lifestyle is recommended to support muscle repair and reduce inflammation and alleviate muscle tension.

A recent study suggests that self-massage is an effective way to manage muscle pain and improve mobility. It has significant potential benefits, especially for those engaged in resistance training. Self-massage has recently gained popularity as a method of managing muscle injuries and pain. It offers athletes a convenient way to reduce pain and limitations in their range of motion (ROM). By minimizing fascial adhesions and the pain resulting from intense training, self-massage may allow athletes to continue training without increasing their risk of further injury. Self-massage is also suggested to aid recovery after high-intensity training sessions. Since pain and restricted movement can hinder training and performance, incorporating self-massage into a recovery and injury prevention routine may enable athletes to train with greater volume and intensity, which could lead to long-term performance improvements.

Source:

MacLennan et al. (2023). Self-Massage Techniques for the Management of Pain and Mobility With Application to Resistance Training: A Brief Review. Journal of Strength and Conditioning Research, 37(11), 2314–2323. https://doi.org/10.1519/jsc.0000000000004575 37883406

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
CKM	rs11559024	TT	2 PMID: 26838040
CPN1	rs61751507	CC	3 PMID: 26838040
DARC	rs12075	GA	1 PMID: 22291609
CR1	rs12034598	AA	3 PMID: 22291609
TMEM57	rs10903129	AG	2 PMID: 22291609
CCR2	rs17141006	TT	3 PMID: 22291609
SLC30A8	rs13266634	CC	3 PMID: 24101675
FAAH	rs324420	AA	2 PMID: 38542272

Fitness - Muscle Property

Muscle Mass Gain

Skeletal muscle is essential for physical function, athletic ability, and metabolic health. Low muscle mass is associated with a higher risk of death in both healthy adults and those with existing health conditions. Muscle mass regulation is a complex process influenced by both external factors, such as environment and behaviors, and internal factors within the body. Resistance exercise training (RET) is an external factor that stands out as the most effective non-chemical method to increase muscle mass. Internal factors, on the other hand, are biological processes happening in the body, often directly within the muscles themselves, that drive muscle growth in conjunction with RET. At the microscopic level, resistance training causes muscle growth (hypertrophy) by prompting existing muscle fibers to build up cellular proteins, such as myofibrillar, sarcoplasmic, and mitochondrial proteins, which increases their cross-sectional area (CSA).

About your result

LOWER POTENTIAL | NORMAL POTENTIAL | **HIGHER POTENTIAL**

Your genetic profile indicates an increased potential for muscle mass gain in response to appropriate training and nutrition.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

Maintain a well-structured and healthy nutritional diet that is calorie and protein-sufficient to support muscle growth, effectively increase muscle mass gain and to promote overall muscle health. In addition to a balanced diet, strategically incorporating supplementation can further enhance muscle development and maintain muscle well-being.

A daily protein intake of 1.4–2.0 grams per kilogram of body weight is generally sufficient for most exercising individuals to build and maintain muscle mass. For optimal muscle protein synthesis (MPS), this daily total should be evenly distributed into servings of 20-40 grams each, consumed every 3-4 hours throughout the day. Each serving should be of high quality, containing all essential amino acids (EAAs) and a significant amount of leucine, approximately 700-3000 milligrams, to effectively stimulate muscle growth. This strategy takes advantage of the long-lasting anabolic effect of resistance exercise, which sensitizes muscle to protein for at least 24 hours. Notably, during periods of caloric restriction, a higher daily intake of 2.3-3.1 g/kg may be required to maximize the retention of lean body mass.

Exercise is known to stimulate muscle growth, and adequate protein intake is vital for building muscle mass. Studies show that protein supplements are most effective when combined with progressive resistance training (PRT). However, for middle-aged and older adults, protein supplements may need to be enhanced with leucine/HMB and vitamin D to be truly effective. Furthermore, there's evidence suggesting that omega-3 fatty acids and vitamin D supplements can help counteract age-related muscle loss and improve physical performance in older individuals.

A study demonstrated that high-intensity functional training, when supplemented with substantial quantities of omega-3 and omega-6 polyunsaturated fatty acids (PUFAs) and antioxidant vitamins, produced a modest yet statistically significant increase in muscle mass and a corresponding reduction in body fat relative to high-intensity functional training performed in isolation.

Research on premenopausal women demonstrated that resistance training combined with specific collagen peptide supplementation resulted in significantly greater improvements compared to resistance training with a placebo. The collagen peptide group showed a larger increase in fat-free mass and hand-grip strength. Furthermore, this group also experienced a significantly greater reduction in fat mass and a more noticeable increase in leg strength when compared to the placebo group.

Source:

Jöger et al. (2017). International Society of Sports Nutrition Position Stand: protein and exercise. Journal of the International Society of Sports Nutrition, 14(1). https://doi.org/10.1186/s12970-017-0177-8 28642676

Cruz-Jentoft et al. (2020). Nutritional strategies for maintaining muscle mass and strength from middle age to later life: A narrative review. Maturitas, 132, 57–64. https://doi.org/10.1016/j.maturitas.2019.11.007 31883664

Posnakidis et al. (2024). Effects of Supplementation with Omega-3 and Omega-6 Polyunsaturated Fatty Acids and Antioxidant Vitamins, Combined with High-Intensity Functional Training, on Exercise Performance and Body Composition: A Randomized, Double-Blind, Placebo-Controlled Trial. Nutrients, 16(17), 2914. https://doi.org/10.3390/nu16172914 39275230

Jendricke et al. (2019). Specific Collagen Peptides in Combination with Resistance Training Improve Body Composition and Regional Muscle Strength in Premenopausal Women: A Randomized Controlled Trial. Nutrients, 11(4), 892. https://doi.org/10.3390/nu11040892 31010031

Exercise

PERSONALIZE RECOMMENDATION

Maintain an active lifestyle and engange in regular physical activity to effectively support muscle gain. Specifically, prioritize engaging in strength training and weight lifting exercises as key components of your routine to stimulate muscle growth.

The evidence strongly suggests that as resistance training volume increases, greater muscle growth is generally observed. While low-volume routines (consisting of four or fewer weekly sets per muscle group) can build muscle and are suitable for individuals with busy schedules or limited energy, such as frail older adults, this study shows that higher-volume training protocols result in greater muscle mass increases. Therefore, to achieve maximal muscle growth, a minimum of 10 weekly sets per muscle group appears to be necessary.

Source:

Schoenfeld et al. (2016). Dose-response relationship between weekly resistance training volume and increases in muscle mass: A systematic review and meta-analysis. Journal of Sports Sciences, 35(11), 1073–1082. https://doi.org/10.1080/02640414.2016.1210197 27433992

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
AMPD1	rs17602729	GA	3 PMID: 39125391
ACTN3	rs1815739	TT	2 PMID: 39424763
MSTN	rs1805086	TT	3 PMID: 33291384
SLC30A8	rs13266634	CC	2 PMID: 24101675

Fitness - Weight Management

Exercise Motivation

Motivation to Exercise reflects an individual's inherent drive to engage in physical activity, driven by enjoyment and satisfaction rather than external necessity. Low motivation is a significant factor in sedentary lifestyles, contributing to the high prevalence of associated health risks like cardiovascular disease, type 2 diabetes, and obesity. Twin studies reveal a substantial genetic component, with heritability estimates for exercise behavior ranging from 48% to 71%. The BDNF gene, particularly the val66met polymorphism, has been linked to variations in intrinsic motivation, potentially through its influence on affective responses to exercise. Understanding both genetic and psychological factors impacting exercise motivation is crucial for creating effective public health strategies to promote physical activity and mitigate the burden of sedentary behavior.

About your result

LOWER POTENTIAL NORMAL POTENTIAL HIGHER POTENTIAL

Your genetic profile suggests you might face more challenges with exercise motivation, or have a decreased natural drive to exercise.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

If your genetic predisposition results in lower exercise motivation, support your efforts with balanced nutrition and hydration to reduce fatigue and improve performance.

Benefit from your naturally higher exercise motivation by optimally fueling your body with balanced nutrition and hydration for peak performance.

Balanced nutrition supports physical activity through proper energy management. Sufficient carbohydrates (5–12g/kg body weight) fuel exercise, while adequate protein (1.2–1.8g/kg) aids muscle repair. Healthy fats (20–35% of energy intake) and essential fatty acids contribute to overall health. Proper hydration (2.2–3.0L/day, adjusted for activity level) enhances performance. Though no diet directly increases exercise motivation, appropriate nutrition can reduce fatigue and improve exercise outcomes, potentially supporting long-term exercise adherence through better energy levels and performance.

Source:

Manore et al. (2005). Exercise and the Institute of Medicine Recommendations for Nutrition. Current Sports Medicine Reports, 4(4), 193–198. https://doi.org/10.1097/01.csmr.0000306206.72186.00 16004827

Lifestyle

PERSONALIZE RECOMMENDATION

If your genetic predisposition affects your exercise motivation, find activities you enjoy, start at your level, and consider social exercise or professional guidance.

Use your naturally high exercise motivation to explore new and enjoyable activities as well as consistently recognizing the personal benefits of regular physical activity to keep your engagement level.

Research shows that engaging in enjoyable, challenging activities can enhance intrinsic motivation to exercise. Recognizing the personal value of exercise, such as health benefits or improved daily functioning, encourage self-motivation. To build confidence, it may be helpful to begin with activities that align with one's current fitness level and gradually progress in intensity or complexity. Incorporating social elements into exercise routines, such as participating in group classes or exercising with others, can also support sustained motivation. If motivation remains a persistent challenge, consulting a healthcare professional or certified exercise specialist can help identify underlying factors and develop a personalized plan.

Source:

Teixeira et al. (2012). Exercise, physical activity, and self-determination theory: A systematic review. International Journal of Behavioral Nutrition and Physical Activity, 9(1), 78. https://doi.org/10.1186/1479-5868-9-78 22726453

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
DRD2/ANKK1	rs1800497	AG	1 PMID: 31404557
FTO	rs8044769	CC	2 PMID: 35393456
DRD2	rs6275	AG	1 PMID: 29637543
COMT	rs4680	GA	1 PMID: 29135816
BDNF	rs6265	CC	2 PMID: 35206257
LEP	rs2167270	GG	1 PMID: 22975643

Fitness - Weight Management

Difficulty in Losing Weight

Difficulty in Losing Weight refers to the challenge some individuals face in reducing body weight despite consistent efforts with diet and exercise. Unlike "obesity risk" (predisposition to gain weight), this trait specifically involves factors hindering weight loss effectiveness regardless of baseline obesity status. Genetic variations, particularly in the IRS1 gene, can influence how individuals respond to weight-loss interventions and contribute to insulin resistance, a key metabolic dysfunction associated with this trait. This affects metabolic health markers like blood sugar and insulin levels, impacting long-term weight management success. The complex interplay between genetic predisposition and lifestyle factors explains why some people struggle more than others to lose weight. Tailoring weight management strategies based on both metabolic health and genetic profiles can significantly improve the effectiveness of interventions for persistent weight issues.

About your result

Your genetic profile indicates an increased likelihood of experiencing difficulty in losing weight.

Our Recommendations

Lifestyle

PERSONALIZE RECOMMENDATION

Given your increased difficulty to lose weight, implement diligent food/activity/weight tracking, specific goals, and proactive meal and alternative activity planning.

For individuals finding it difficult to lose weight, incorporating consistent daily habits can be beneficial. This includes regularly tracking food intake and physical activity levels, perhaps using a journal or mobile application, to increase awareness of patterns. Monitoring body weight on a weekly basis can help track progress and identify trends. Setting achievable and specific goals related to diet and activity can provide direction and motivation. Developing strategies to address challenges and obstacles that arise, such as planning healthy meals in advance or finding alternative activities when facing sedentary temptations, can support long-term success. Prioritizing regular physical activity and adhering to a reduced-calorie dietary pattern are fundamental lifestyle adjustments for weight management.

Source:

Wadden et al. (2020). Lifestyle modification approaches for the treatment of obesity in adults. American Psychologist, 75(2), 235–251. https://doi.org/10.1037/amp0000517 32052997

Dietary

PERSONALIZE RECOMMENDATION

Overcome weight loss challenges by exploring tailored diets like low-calorie, keto, or high-protein with professional guidance for suitability.

Research suggests that individuals experiencing difficulty in losing weight despite initial efforts may consider several dietary strategies. Low-calorie diets, focusing on either reduced fat or carbohydrate intake, are a common starting point for creating an energy deficit. In some instances, a very-low-calorie diet (VLCD) might be considered under strict medical supervision for significant weight loss. Macronutrient-focused approaches such as a ketogenic diet (very low carbohydrate, high fat) or a high-protein diet may also be explored, as the latter can enhance satiety. The Mediterranean diet, rich in fruits, vegetables, healthy fats, and lean protein, is another option that supports weight management and overall health. Consulting a healthcare provider or registered dietitian is recommended to determine the most suitable and sustainable dietary plan.

Source:

Kim et al. (2021). Optimal Diet Strategies for Weight Loss and Weight Loss Maintenance. Journal of Obesity & Metabolic Syndrome, 30(1), 20–31. https://doi.org/10.7570/jomes20065 33107442

Exercise

PERSONALIZE RECOMMENDATION

While exercise is crucial, be mindful that weight loss results might require pairing exercise consistently with dietary management due to potential compensation.

Some individuals may struggle to lose weight through exercise alone due to natural compensatory responses, such as increased hunger or higher calorie intake, which can offset the calories burned. While exercise is vital for overall health and helps maintain weight loss, dietary changes often play a stronger role in driving initial weight reduction. For those facing challenges, combining a balanced, calorie-conscious diet with consistent physical activity may yield better results than exercise alone. Individual responses to exercise for weight loss can vary, and factors like baseline activity levels might influence the outcomes.

Source:

Flack, K. D., et al. (2023). Altered motivation states for physical activity and 'appetite' for movement as compensatory mechanisms limiting the efficacy of exercise training for weight loss. Frontiers in Psychology, 14, 1098394. https://doi.org/10.3389/fpsyg.2023.1098394 37187558

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
LEP	rs4731426	CC	1 PMID: 21042325
FUBP1/DNAJB4	rs12401738	GG	2 PMID: 26253612
FTO	rs3751812	TT	1 PMID: 23628854
IRS1	rs2943641	TT	1 PMID: 21747052
FTO	rs1558902	AA	1 PMID: 26193063
FTO	rs9939609	AA	1 PMID: 30419927
MC4R	rs17782313	TC	1 PMID: 24827639
TCF7L2	rs7903146	TT	1 PMID: 20032493
TCF7L2	rs12255372	GT	1 PMID: 23034957

Fitness - Weight Management

Obesity Risk

Obesity risk indicates an individual's genetic predisposition to accumulate excessive body fat, which significantly increases the likelihood of developing various health complications. This trait is influenced by hundreds of genetic variants with small effects (polygenic obesity) and rarer single-gene mutations (monogenic obesity). Genome-wide association studies have identified over a thousand loci associated with BMI, particularly in leptin-melanocortin pathways. Although genetics substantially contribute to obesity (40%-70% heritability), environmental factors are still critical drivers of the global obesity epidemic. Worldwide, rates of overweight and obesity continue to grow in adults and children. From 1990 to 2022, the percentage of children and adolescents aged 5–19 years old who were obese increased fourfold, from 2% to 8%, while the percentage of adults aged 18 and older who were obese more than doubled, from 7% to 16%. Understanding genetic and environmental risks is essential for the effective prevention and personalized management of obesity and its serious health consequences.

About your result

LOWER RISK NORMAL RISK **HIGHER RISK**

Your genetic profile indicates an increased risk of developing obesity.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

Address your increased obesity risk by prioritizing sustained caloric restriction through a personalized dietary plan, potentially with guidance.

Sustained weight loss, a key factor in reducing obesity risk, requires a negative energy balance achieved through caloric restriction. Diets with reduced calorie intake—whether lower in fat, carbohydrates, or other macronutrients—consistently lead to short-term weight loss. Practical methods such as portion-controlled meals or meal replacements can improve adherence by simplifying calorie management. While various dietary patterns (e.g., low-carbohydrate, high-protein, or Mediterranean diets) are effective for weight reduction, long-term success depends on maintaining the chosen approach. Individual factors, including metabolic health and food preferences, influence outcomes. For optimal obesity risk reduction, consultation with a healthcare professional or registered dietitian is recommended to develop a sustainable and personalized dietary plan.

Source:

Chao et al. (2021). Dietary interventions for obesity: clinical and mechanistic findings. Journal of Clinical Investigation, 131(1). https://doi.org/10.1172/jci140065 33393504

Exercise

PERSONALIZE RECOMMENDATION

Address your increased obesity risk with 150-200 minutes or more of weekly aerobic exercise plus resistance training. Additionally, consult professionals before HIIT.

To mitigate obesity risk, aim for at least 150 to 200 minutes of moderate-intensity aerobic exercise per week, as research indicates this is effective for weight and fat loss. This type of activity helps burn calories and improve body composition. Additionally, incorporate resistance training at moderate-to-high intensity to preserve lean body mass, which supports a healthy metabolism. Building and maintaining muscle mass through resistance exercises helps the body burn more calories at rest. If considering high-intensity interval training (HIIT), consult a healthcare professional beforehand to assess cardiovascular risk and ensure supervised implementation.

Source:

Oppert et al. (2021). Exercise training in the management of overweight and obesity in adults: Synthesis of the evidence and recommendations from the European Association for the Study of Obesity Physical Activity Working Group. Obesity Reviews, 22(S4). Portico. https://doi.org/10.1111/obr.13273 34076949

Lifestyle

PERSONALIZE RECOMMENDATION

Counteract your increased obesity risk by actively boosting daily movement through activities like walks and stairs, alongside necessary dietary adjustments.

To reduce obesity risk, consider making lifestyle changes that increase your total daily energy expenditure. Incorporating more movement into your daily routine, such as taking short walks, using stairs instead of elevators, or engaging in active hobbies, can contribute significantly to your overall physical activity levels. Research suggests that aiming for a Physical Activity Level (PAL) greater than 1.60 may help prevent weight gain. Remember that these lifestyle changes are most effective when combined with dietary adjustments aimed at reducing daily caloric intake for a comprehensive approach to managing weight.

Source:

*Stone, T., DiPietro, L., & Stachenfeld, N. S. (2000). Exercise treatment of obesity. In K. R. Feingold, S. F. Ahmed, B. Anawalt, M. R. Blackman, A. Boyce, G. Chrousos, E. Corpas, W. W. de Herder, K. Dhatariya, K. Dungan, J. Hofland, S. Kalra, G. Kaltsas, N. Kapoor, C. Koch, P. Kopp, M. Korbonits, C. S. Kovacs, W. Kuohung, ... D. P. Wilson (Eds.), Endotext. MDText.com, Inc. http://www.ncbi.nlm.nih.gov/books/NBK278961/ **

Monitoring

PERSONALIZE RECOMMENDATION

Proactively manage your increased risk by seeking professional guidance before exercise changes and maintaining regular follow-ups for plan adjustments.

To effectively mitigate obesity risk, it is advisable to consult a healthcare professional before starting a new or significantly intense exercise program, especially if you have pre-existing health conditions. Work with doctors or registered dietitians to develop a comprehensive weight management plan that incorporates personalized exercise strategies and appropriate dietary modifications. Regular follow-ups with your healthcare provider can help you monitor your progress, address any challenges you may face, and adjust your plan as needed to optimize your outcomes. If you experience any discomfort or adverse symptoms while exercising, seek medical advice right away.

Source:

*Stone, T., DiPietro, L., & Stachenfeld, N. S. (2000). Exercise treatment of obesity. In K. R. Feingold, S. F. Ahmed, B. Anawalt, M. R. Blackman, A. Boyce, G. Chrousos, E. Corpas, W. W. de Herder, K. Dhatariya, K. Dungan, J. Hofland, S. Kalra, G. Kaltsas, N. Kapoor, C. Koch, P. Kopp, M. Korbonits, C. S. Kovacs, W. Kuohung, ... D. P. Wilson (Eds.), Endotext. MDText.com, Inc. http://www.ncbi.nlm.nih.gov/books/NBK278961/ **

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
FTO	rs9939609	AA	1 PMID: 22109280
ADIPOQ	rs2241766	TT	1 PMID: 36126070
FTO	rs17817449	GG	1 PMID: 36126070
FTO	rs1421085	CC	1 PMID: 36126070
FTO	rs1558902	AA	1 PMID: 36126070
LEPR	rs1137101	AG	1 PMID: 36126070
CETP	rs3764261	CA	1 PMID: 36126070
FTO	rs9941349	TT	1 PMID: 36126070
FTO	rs8050136	AA	1 PMID: 20061430
MC4R	rs17782313	TC	1 PMID: 20061430
GNPDA2	rs10938397	AG	1 PMID: 20061430

Fitness - Weight Management

Metabolic Rate

Metabolic rate, specifically resting metabolic rate (RMR), determines how much energy your body burns at rest. This is commonly described as having a "fast" or "slow" metabolism. RMR reflects the energy needed for basic bodily functions and is a significant portion of your total daily energy expenditure. Genetic predisposition plays a key role in RMR, and studies indicate that it has a polygenic basis. Variations in multiple genes, many of which are associated with obesity risk, collectively determine baseline energy expenditure. Overall heritability is approximately 40%. This rate varies considerably between individuals, influenced by ethnicity, body composition, and organ size. Notable ethnic differences exist: Asians and individuals of African descent often exhibit lower RMR compared to Europeans, primarily due to differences in fat-free mass (FFM). South Asians may have an even lower metabolism than other Asian groups. Understanding these variations is important for understanding individual differences in energy expenditure and its implications for weight management and overall metabolic health.

About your result

LOWER POTENTIAL | **NORMAL POTENTIAL** | HIGHER POTENTIAL

Your genetic profile suggests a normal or typical metabolic rate.

Our Recommendations

Dietary

PERSONALIZE RECOMMENDATION

Optimize your metabolism by including lean protein with each meal, leveraging its higher thermic effect compared to carbs and fats.

Dietary choices can influence your metabolic rate, specifically the thermic effect of food (TEF), which accounts for roughly 10% of daily energy expenditure. Protein has the highest thermogenic effect (20-30% of its caloric value), significantly boosting metabolism compared to carbohydrates (5-10%) or fats (0-3%). Prioritizing lean protein sources in each meal can therefore be a beneficial strategy. For every 24 kcal increase in energy intake, research shows that diet-induced thermogenesis also increases by 0.26 kcal/day. Consider consulting a registered dietitian or nutritionist, particularly if you have specific dietary needs, health conditions, or weight management goals, for support.

Source:
*National Academies of Sciences, E., Division, H. and M., Board, F. and N., & Energy, C. on the D. R. I. for. (2023). Factors affecting energy expenditure and requirements. In Dietary Reference Intakes for Energy. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK591031/ **

Exercise

PERSONALIZE RECOMMENDATION

Boost your resting metabolism by incorporating resistance training at least twice weekly to build calorie-burning muscle mass effectively.

Resistance training, which includes activities like lifting weights, using resistance bands, or bodyweight exercises (e.g., squats, push-ups), can significantly increase your resting metabolic rate (RMR) by around 96 kCal/day. This boost is likely because resistance training builds muscle, and muscle tissue burns more calories than fat tissue (fat-free mass explains 25-70% of the variance in RMR). Aim for at least two resistance training sessions per week, working all major muscle groups (legs, chest, back, shoulders, arms), gradually increasing the weight, resistance, or number of repetitions. Consult a healthcare professional before starting if you have health concerns or need guidance on proper form.

Source:

MacKenzie-Shalders et al. (2020). The effect of exercise interventions on resting metabolic rate: A systematic review and meta-analysis. Journal of Sports Sciences, 38(14), 1635–1649. https://doi.org/10.1080/02640414.2020.1754716 32397898

Lifestyle

PERSONALIZE RECOMMENDATION

Support your metabolic rate by incorporating more daily movement like taking stairs, standing more, and reducing overall sedentary time.

Incorporating more non-exercise physical activity into your daily routine can significantly impact your overall energy expenditure, contributing to 15-50% of total energy expenditure. This includes activities like fidgeting, maintaining posture, and activities of daily living. Aim to reduce sedentary time, which increases by approximately 30 minutes per year from ages 3-13 based on the research, by incorporating short movement breaks throughout the day. Simple changes, like standing or pacing while on calls, using stairs instead of elevators, or engaging in light housework, can boost calorie burning without structured exercise. If you are able to do more advanced movement, such as sport, consider to do that.

Source:

*National Academies of Sciences, E., Division, H. and M., Board, F. and N., & Energy, C. on the D. R. I. for. (2023). Factors affecting energy expenditure and requirements. In Dietary Reference Intakes for Energy. National Academies Press (US). https://www.ncbi.nlm.nih.gov/books/NBK591031/ **

Gene Details

Your Gene Table

Level of scientific evidence 1 Highest 2 Moderate 3 Lowest

Gene	rsID	Genotype	Reference
CELSR2	rs12740374	GT	1 PMID: 39018443
FTO	rs17817449	GG	1 PMID: 18316358