TED

肌肉增长的奥秘

题目： What make muscles grow
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Muscles. We have over 600 of them. They make up between 1/3 and 1/2 of our body weight, and along with connective tissue, they bind us together, hold us up, and help us move. And whether or not body building is your hobby, muscles need your constant attention because the way you treat them on a daily basis determines whether they will wither or grow.
肌肉，我们有超过600块，大约占了身体重量的三分之一到二分之一。它们和结缔组织一起 组成我们的身体，使我们能够站立和移动，不管健身是不是你的兴趣爱好，肌肉需要你持续关注。因为你每天的锻炼情况会决定肌肉是萎缩还是增长。

connective tissue
结缔组织

body building
健身；健美

Say you're standing in front of a door, ready to pull it open.Your brain and muscles are perfectly poised to help you achieve this goal. First, your brain sends a signal to motor neurons inside your arm. When they receive this message, they fire, causing muscles to contract and relax, which pull on the bones in your arm and generate the needed movement. The bigger the challenge becomes, the bigger the brain's signal grows, and the more motor units it rallies to help you achieve your task.
假想你正站在一扇门前，准备拉门你的大脑和肌肉会达成完美的平衡以帮助你达成目标。首先，你的大脑给遥控你手臂的神经发射信号，神经接受信号之后，开始行动引起肌肉收缩与放松牵引手臂的骨骼运动，从而做出相应的动作动作难度越大，大脑发出的信号越强，协助完成动作所调动的遥控神经单位越多。

poised
adj.准备好的

motor neurons
运动神经元

But what if the door is made of solid iron? At this point, your arm muscles alone won't be able to generate enough tension to pull it open, so your brain appeals to other muscles for help. You plant your feet, tighten your belly, and tense your back, generating enough force to yank it open. Your nervous system has just leveraged the resources you already have, other muscles, to meet the demand.
但是如果门是铁制的呢？ 现在，光靠你手臂的肌肉是不能产生足够的拉力来开门的，所以你的大脑会让其他肌肉来帮忙。你扎好马步，收紧小腹，拉紧脊背， 产生足够的力把门扯开，你的神经系统刚刚借用了你所有的已有资源： 别的肌肉，来完成你的目标。

While all this is happening, your muscle fibers undergo another kind of cellular change. As you expose them to stress, they experience microscopic damage, which, in this context, is a good thing. In response, the injured cells release inflammatory molecules called cytokines that activate the immune system to repair the injury. This is when the muscle-building magic happens. The greater the damage to the muscle tissue, the more your body will need to repair itself. The resulting cycle of damage and repair eventually makes muscles bigger and stronger as they adapt to progressively greater demands.
当这一切发生时，你的肌肉纤维经历了细胞层面的变化。你拉伸细胞时，细胞经历了细微的损伤，在这里，是一件好事。作为回应，受损的细胞会释放出被称作细胞因子的炎性分子，激活了免疫系统以修复损伤 这就是肌肉变大的魔法。对肌肉组织造成的损伤越大， 你身体的自我修复就会越多，损伤和修复的循环，最终使肌肉变大变结实，逐渐适应更大的需求。

iron
n.铁

tension
n.紧张；焦虑

leveraged
adj.杠杆作用的

muscle fibers
肌肉纤维

cellular
adj.细胞的

microscopic
adj.极小的

inflammatory
adj.炎症性的

cytokines
细胞因子

immune system
免疫系统

Since our bodies have already adapted to most everyday activities, those generally don't produce enough stress to stimulate new muscle growth. So, to build new muscle, a process called hypertrophy, our cells need to be exposed to higher workloads than they are used to. In fact, if you don't continuously expose your muscles to some resistance, they will shrink, a process known as muscular atrophy. In contrast, exposing the muscle to a high-degree of tension, especially while the muscle is lengthening, also called an eccentric contraction, generates effective conditions for new growth.
因为我们的身体已经适应了日常的活动， 这些就不能产生足够的压力，来促进新的肌肉生长了。所以，要长肌肉，要经过一个叫过度增长的过程，我们的细胞需要比它已经适应的更大的工作强度。
事实上，如果你不持续的让肌肉锻炼起来， 它们会变小，这被称为肌肉萎缩。相反的，让肌肉承受更高的拉力， 特别是肌肉在伸展时，又被称作离心收缩， 为肌肉提供有效的生长条件。

hypertrophy
n.过度增大

muscular atrophy
肌肉萎缩

eccentric contraction
离心收缩

However, muscles rely on more than just activity to grow. Without proper nutrition, hormones, and rest, your body would never be able to repair damaged muscle fibers. Protein in our diet preserves muscle mass by providing the building blocks for new tissue in the form of amino acids. Adequate protein intake, along with naturally occurring hormones, like insulin-like growth factor and testosterone, help shift the body into a state where tissue is repaired and grown.
然而，肌肉生长还要更多条件，没有所需的营养，激素，和休息， 你的身體永远不能修复受损的肌肉组织。我们饮食中的蛋白质通过以氨基酸的形式，提供新组织的基础 来维持细胞的质量，足量的蛋白质摄入，与自然产生的荷尔蒙一起， 比如胰岛素，比如生长因子和睾酮，协助组织的修复和生长。

nutrition
n.营养

hormones
n.荷尔蒙

amino acid
氨基酸

testosterone
n.睾酮

This vital repair process mainly occurs when we're resting, especially at night while sleeping. Gender and age affect this repair mechanism, which is why young men with more testosterone have a leg up in the muscle building game. Genetic factors also play a role in one's ability to grow muscle. Some people have more robust immune reactions to muscle damage, and are better able to repair and replace damaged muscle fibers, increasing their muscle-building potential.

这个至关重要的修复过程主要发生在我们休息时， 尤其是晚上睡觉的时候。性别和年龄也会影响修复机制， 这就是为什么有更多睾酮的青壮年， 在肌肉增长上更有优势。基因因素也会影响肌肉增长，有些人对肌肉损伤有更强大的免疫反应， 更容易修复和替换受损肌肉纤维，这都加大了肌肉增长的潜力。

The body responds to the demands you place on it. If you tear your muscles up, eat right, rest and repeat, you'll create the conditions to make your muscles as big and strong as possible. It is with muscles as it is with life: Meaningful growth requires challenge and stress.

身体会对你的需求做出回应，如果你撕裂肌肉，补充营养，休息然后重复，你就为肌肉变大变强壮创造了条件。肌肉增长和生活一个道理： 有效的成长需要挑战和压力。

mechanism
n.机械装置