TED 运动改变大脑

题目： The brain-changing benefits of exercise
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What if I told you there was something that you can do right now that would have an immediate, positive benefit for your brain including your mood and your focus? And what if I told you that same thing could actually last a long time and protect your brain from different conditions like depression, Alzheimer's disease or dementia. Would you do it? Yes!
如果我告诉你有件事你马上去做的话 就会对你的大脑，包括情绪和专注力 立刻产生积极作用？ 如果我告诉你它可长期维持 并保护你的大脑免受 如抑郁、老年痴呆或是失智症等 不同病况的侵袭。 你会愿意去做这件事吗？ 愿意！

depression
n.抑郁

dementia
n.痴呆

I am talking about the powerful effects of physical activity. Simply moving your body, has immediate, long-lasting and protective benefits for your brain. And that can last for the rest of your life. So what I want to do today is tell you a story about how I used my deep understanding of neuroscience, as a professor of neuroscience, to essentially do an experiment on myself in which I discovered the science underlying why exercise is the most transformative thing that you can do for your brain today. Now, as a neuroscientist, I know that our brains, that is the thing in our head right now, that is the most complex structure known to humankind. But it's one thing to talk about the brain, and it's another to see it.
我所说的就是体育运动的強大效果。 简单地让你的身体动起来， 就能够对你的大脑产生 即时的和长期的保护功效。 而且可以持续一生的时间。 所以我今天想要分享一个故事， 关于我如何使用 我所深度理解的神经科学， 作为一名神经科学教授， 我在自己身上做了一项实验， 在这个实验中我发现了 为什么运动最易转化成 对你的大脑有益的东西。 作为一名神经科学家， 我知道我们的大脑， 就是我们脑袋中的东西，是对人类所知的最为复杂的结构。 但是谈论大脑， 和亲眼看到它是两件事。

long-lasting
持续的

neuroscience
n.神经科学

neuroscientist
n.神经科学家

So here is a real preserved human brain. And it's going to illustrate two key areas that we are going to talk about today. The first is the prefrontal cortex, right behind your forehead, critical for things like decision-making, focus, attention and your personality. The second key area is located in the temporal lobe, shown right here. You have two temporal lobes in your brain, the right and the left, and deep in the temporal lobe is a key structure critical for your ability to form and retain new long-term memories for facts and events. And that structure is called the hippocampus.

这是一个真实保存的人类大脑。 它会展示我们今天所要讨论的 两个关键部分。 第一部分是前额皮层， 就在你额头后面， 对做决定、专注力、注意力及性格等 至关重要。 第二个重要的区域是在颞叶， 右边这里。 在大脑里有两个颞叶， 右边一个左边一个， 在颞叶深处有一个非常关键的结构 它对你的能力至关重要 能够形成和保存对事实、事件的 长期记忆。 它被称作海马体。

illustrate
v.说明

forehead
额头

temporal lobe
额叶

hippocampus
海马体

So I've always been fascinated with the hippocampus. How could it be that an event that lasts just a moment, say, your first kiss, or the moment your first child was born, can form a memory that has changed your brain, that lasts an entire lifetime? That's what I want to understand. I wanted to start and record the activity of individual brain cells in the hippocampus as subjects were forming new memories. And essentially try and decode how those brief bursts of electrical activity, which is how neurons communicate with each other, how those brief bursts either allowed us to form a new memory, or did not.

我一直对海马体非常着迷。 一件短暂的事情， 比如说，你的初吻，或者你第一个孩子诞生的时刻， 如何形成一个能够改变你的大脑 且持续终生的记忆？ 这是我想要去弄明白的。 我想要去开始记录 当形成新的记忆的时候 海马体中每个单独细胞活动。 从本质上尝试解码 这些电流活动的短暂爆发， 这是神经元相互交流的方式， 这些短暂的爆发或让我们 形成一段新的记忆，或没有。

individual
adj.个人的，单独的

But a few years ago, I did something very unusual in science. As a full professor of neural science, I decided to completely switch my research program. Because I encountered something that was so amazing, with the potential to change so many lives that I had to study it. I discovered and I experienced the brain-changing effects of exercise. And I did it in a completely inadvertent way. I was actually at the height of all the memory work that I was doing -- data was pouring in, I was becoming known in my field for all of this memory work. And it should have been going great. It was, scientifically. But when I stuck my head out of my lab door, I noticed something. I had no social life. I spent too much time listening to those brain cells in a dark room, by myself.

neural science
神经科学

encounter
v.遭遇，偶遇

inadvertent
adj.疏忽的

scientifically
adv.系统的

但是几年之前， 我做了一些科学界中很少见的实验。 作为一个神经科学的全职教授， 我决定完全扭转我的研究计划。 因为我遇到了如此神奇的事物， 它有可能改变众多人的生命 我必须要去研究它。 我发现并亲身经历了 运动对大脑的改变。 而且是一种完全 "无心插柳柳成荫"的方式。 事实上当时我正处于 所有记忆工作的最高点—— 数据如潮水般涌入， 因为记忆研究工作, 我在那一领域正在声名鹊起。 它可以变得更出色， 从科学角度来讲，它正是如此。 但当我在实验室外时， 我注意到一件事， 那就是我没有社交生活。 我花费了太多时间倾听那些脑细胞上 在黑暗的屋子里，独自一人。

I didn't move my body at all. I had gained 25 pounds. And actually, it took me many years to realize it, I was actually miserable. And I shouldn't be miserable. And I went on a river-rafting trip -- by myself, because I had no social life. And I came back -- thinking, "Oh, my God, I was the weakest person on that trip." And I came back with a mission. I said, "I'm never going to feel like the weakest person on a river-rafting trip again."

miserablenes
adj.痛苦的

我完全不运动。 我已经长胖了25磅。 事实上，我花费了很多年 才意识到这个问题。 我当时是很糟糕的， 而我本不该如此。 我自己一个人去做了一次漂流， 因为我没朋友啊。 然后当我回来后——想着，“天哪，我是那趟旅程最弱的一个。”我回来后给自己下了一个任务。 我对自己说，“我再也不要这种感受， 再也不要做 一个漂流之中最弱的那个。

And that's what made me go to the gym. And I focused my type-A personality on going to all the exercise classes at the gym. I tried everything. I went to kickbox, dance, yoga, step class, and at first it was really hard. But what I noticed is that after every sweat-inducing workout that I tried, I had this great mood boost and this great energy boost. And that's what kept me going back to the gym. Well, I started feeling stronger. I started feeling better, I even lost that 25 pounds.
这个想法促使我走进了健身房。 我的A型人格促使我 尝试了健身房所有运动。 我尝试了一切。 我做了拳击训练，舞蹈，瑜伽， 踏步教程， 开始的时候确实很难。 但我注意到每一次汗水挥洒后， 我的情绪都变得非常好， 精力也更好。 那促使我一直不断走进健身房。 然后我开始感受到自己变得强壮。 我感受非常好， 甚至还减掉了那25磅。

kickbox
v.踢拳

sweat-inducing
汗水挥洒

And now, fast-forward a year and a half into this regular exercise program and I noticed something that really made me sit up and take notice. I was sitting at my desk, writing a research grant, and a thought went through my mind that had never gone through my mind before. And that thought was, "Gee, grant-writing is going well today." And all the scientists -- yeah, all the scientists always laugh when I say that, because grant-writing never goes well. It is so hard; you're always pulling your hair out, trying to come up with that million-dollar-winning idea.

现在，自我经常去参加运动后 已经一年半过去了， 我注意到有些东西值得我坐下来记录。 当时我正坐在桌旁， 写着一份研究基金申请，一个想法突然从脑海冒出来， 此前我从未这样想过。 这个想法就是，“天哪， 申请材料今天写的很顺利嘛。”所有的科学家——对，所有科学家都会在 我这样说的时候大笑， 因为基金申请写作从来都不好写。它太难了，你总是绞尽脑汁， 试图想出能够赢得百万美金的想法。

But I realized that the grant-writing was going well, because I was able to focus and maintain my attention for longer than I had before. And my long-term memory -- what I was studying in my own lab -- seemed to be better in me. And that's when I put it together.
但我意识到那次写作很顺利， 因为我能够专注地保持我的注意力 比以前时间都要久。 我的长期记忆—— 就是我实验室里研究的东西 显示也更好了。 从那时起我将它们联系在一起。

Maybe all that exercise that I had included and added to my life was changing my brain. Maybe I did an experiment on myself without even knowing it. So as a curious neuroscientist, I went to the literature to see what I could find about what we knew about the effects of exercise on the brain. And what I found was an exciting and a growing literature that was essentially showing everything that I noticed in myself. Better mood, better energy, better memory, better attention. And the more I learned, the more I realized how powerful exercise was. Which eventually led me to the big decision to completely shift my research focus.
或许我所有的运动 都在改变我的大脑。 或许我在自己没有意识到的情况下 对我自己进行了一项实验。 作为一个好奇的神经学家， 我去文献里面查找现有已知的 关于运动对于大脑的影响。 我发现一项让人欣喜的且正在增长的 文献记载 记载了几乎所有发生在我身上的事 更好的情绪、精力、记忆力和 专注力。 我所了解越多， 我就越认识到运动的魅力， 这也指引我做了一个重大决定 来完全扭转我的研究方向。

literature
n.文学

And so now, after several years of really focusing on this question, I've come to the following conclusion: that exercise is the most transformative thing that you can do for your brain today for the following three reasons. Number one: it has immediate effects on your brain. A single workout that you do will immediately increase levels of neurotransmitters like dopamine, serotonin and noradrenaline. That is going to increase your mood right after that workout, exactly what I was feeling.

现在，经过几年对 这个问题的专注研究， 我得到了以下结论： 运动是当下你所能做的对大脑最好的 最具转化性的东西， 有以下三个原因：原因一：它对你的大脑有 立刻的影响。 你所做的每一点运动 都会立刻提升你神经递质的水平 像是海马体、血清素和 去甲肾上腺素。所以它会立马提升你的情绪， 就像我所体会到的。

transformative
adj.转化性的

neurotransmitter
神经递质

dopamine
多巴胺

serotonin
血清素

noradrenaline
甲肾上腺素

My lab showed that a single workout can improve your ability to shift and focus attention, and that focus improvement will last for at least two hours. And finally, studies have shown that a single workout will improve your reaction times which basically means that you are going to be faster at catching that cup of Starbucks that falls off the counter, which is very, very important. But these immediate effects are transient, they help you right after.

我的实验显示，单个短暂的运动 可以提升你转移和集中注意力的能力， 这种提升可以持续至少两个小时。 最后，研究还显示， 运动本身可以提高你的反应时间 这意味着 你在接星巴克杯子的时候更迅速 如果它掉下柜台的话， 这一点可以说是相当重要了。这些效果之所以能够长期有用 是因为运动改变了大脑的解剖结构， 生理机能和功能。

Starbucks
星巴克

And these effects are long-lasting because exercise actually changes the brain's anatomy, physiology and function. Let's start with my favorite brain area, the hippocampus. The hippocampus -- or exercise actually produces brand new brain cells, new brain cells in the hippocampus, that actually increase its volume, as well as improve your long-term memory, OK? And that including in you and me.

anatomy
解剖结构

hippocampus
海马体

这些效果之所以能够长期有用 是因为运动改变了大脑的解剖结构， 生理机能和功能。 让我们从我最喜欢的大脑区域开始， 海马体。 海马体 —— 或者说是运动实际上 能够产生全新的脑细胞， 海马体中的全新脑细胞能够增加它的数量， 同时提升你的长期记忆力。 这些对你我都适用。

Number two: the most common finding in neuroscience studies, looking at effects of long-term exercise, is improved attention function dependent on your prefrontal cortex. You not only get better focus and attention, but the volume of the hippocampus increases as well. And finally, you not only get immediate effects of mood with exercise but those last for a long time. So you get long-lasting increases in those good mood neurotransmitters.

neuroscience
神经科学

原因二： 在神经科学研究中最常见的发现 是长期运动的影响 它能够单独提升你的注意力 或是你的前额皮层。 你不仅能够得到更好的专注力， 同时也增加了你的海马体数量。 最后一点是你不仅能够 获得即时的愉悦心情 这种情绪还能够维持较长的时间。 所以你获得的是能够长期存在的 情绪转化神经元。

But really, the most transformative thing that exercise will do is its protective effects on your hippocampus. Here you can think about the brain like a muscle. The more you're working out, the bigger and stronger your hippocampus and prefrontal cortex gets.

prefrontal cortex
前额皮层

但实际上，运动所做的 最具变革意义的事情是 它对于大脑的保护作用。 你可以将大脑想象成是一块肌肉。 你运动的越多， 你的海马体和前额皮层 就越大越强壮。

Why is that important? Because the prefrontal cortex and the hippocampus are the two areas that are most susceptible to neurodegenerative diseases and normal cognitive decline in aging. So with increased exercise over your lifetime, you're not going to cure dementia or Alzheimer's disease, but what you're going to do is you're going to create the strongest, biggest hippocampus and prefrontal cortex so it takes longer for these diseases to actually have an effect. You can think of exercise, therefore, as a supercharged 401K for your brain, OK? And it's even better, because it's free.

为什么这一点很重要呢？ 因为前额皮层和海马体 是最易神经退化疾病影响的两个区域 并容易随着年龄增长认知能力下降。 所以增加运动量， 你不仅能够预防痴呆和 阿兹海默综合症， 你更能够创造 最强壮有力的海马体和前额皮层 所以能够更有效低于这些疾病。 因此，你可以把运动想象成是 为你的大脑额外提供的401退休金计划， 对不对？ 而且更棒的是，它是免费的。

So this is the point in the talk where everybody says, "That sounds so interesting, Wendy, but I really will only want to know one thing. And that is, just tell me the minimum amount of exercise I need to get all these changes."

所以重点来了，大家都会说，“这听起来很不错啊，温蒂， 但我事实上只想知道一件事。 告诉我吧，运动的最低量是多少 如果我想要实现你所说的这些变化。“

And so I'm going to tell you the answer to that question. First, good news: you don't have to become a triathlete to get these effects. The rule of thumb is you want to get three to four times a week exercise minimum 30 minutes an exercise session, and you want to get aerobic exercise in. That is, get your heart rate up.

我马上就会给出答案。 首先，好消息是：你不需要参加 铁人三项才能获得这些改变。 首要的原则是你需每周运动三到四次 每次最低30分钟， 要包含有氧运动。 这样能够让你的心率加快。

prefrontal cortex
前额皮层

susceptible
adj.易受影响的

neurodegenerative diseases
神经退化疾病

dementia
n.痴呆

hippocampus
海马结构

supercharged
adj.超动力的

triathlete
参加三项全能比赛运动员

thumb
n.拇指

aerobic
adj.需氧的

And the good news is, you don't have to go to the gym to get a very expensive gym membership. Add an extra walk around the block in your power walk. You see stairs -- take stairs. And power-vacuuming can be as good as the aerobics class that you were going to take at the gym.
还有一个好消息是你不需要走进健身房 来办一张昂贵的会员卡。 在你能力范围内在周边街区多走一圈。 如果见到台阶-就走走台阶。 这些能量的聚集和有氧课程是一样的 就像你在健身房上的一样。

power-vacuuming
能力范围内

So I've gone from memory pioneer to exercise explorer. From going into the innermost workings of the brain, to trying to understand how exercise can improve our brain function, and my goal in my lab right now is to go beyond that rule of thumb that I just gave you -- three to four times a week, 30 minutes. I want to understand the optimum exercise prescription for you, at your age, at your fitness level, for your genetic background, to maximize the effects of exercise today and also to improve your brain and protect your brain the best for the rest of your life.
所以我从记忆先锋 变成了运动探索者。 从深入大脑内部的运作， 到尝试了解运动 如何来提升大脑的性能， 我现在的实验室目标是 超越我刚刚所给你们的首要原则—— 每周三到四次大于30分钟。 我想要为你了解运动的最佳配方 根据你们年龄，健身的情况， 以及基因背景， 来实现当前运动效果的最大化 同时为你的余生来提升 和保护你的大脑。

optimum
adj.最优的

background
n.出身背景

But it's one thing to talk about exercise, and it's another to do it. So I'm going to invoke my power as a certified exercise instructor, to ask you all to stand up.We're going to do just one minute of exercise. It's call-and-response, just do what I do, say what I say, and make sure you don't punch your neighbor, OK? Music!
但是知易行难， 所以让我来以一个 认证运动教练的身份来呼吁你们，请大家起身，我们来做一个一分钟的运动。 名字叫“我说你应”， 请做我所做，说我所说， 当然确保你不要打到邻座， 准备好了吗？ 音乐!

certified
adj.adj.被证明的

Five, six, seven, eight, it's right, left, right, left. And I say, I am strong now. Let's hear you.
Audience: I am strong now.
Wendy Suzuki: Ladies, I am Wonder Woman-strong. Let's hear you!
Audience: I am Wonder Woman-strong.
WS: New move -- uppercut, right and left. I am inspired now. You say it!
Audience: I am inspired now.
WS: Last move -- pull it down, right and left, right and left. I say, I am on fire now! You say it.
Audience: I am on fire now.
WS: And done! OK, good job!
五六七八，右左右左。 现在我要说，我很强壮。 请跟我重复。
观众：我很强壮。
女士们，我是神奇女侠。 请跟我重复。
观众：我是神奇女侠。
新动作——勾拳，右左。 我激情澎湃。请跟我重复。
观众：我激情澎湃。
最后一个——往下走，右左，右左。 我在燃烧！跟我重复。
观众：我在燃烧。
好，做的很棒！

Thank you. I want to leave you with one last thought. And that is, bringing exercise in your life will not only give you a happier, more protective life today, but it will protect your brain from incurable diseases. And in this way it will change the trajectory of your life for the better.
谢谢。 我想要和你们分享最后一点心得。 把运动引入你的生活 不仅仅能够给你一个更开心的、 备受保护的当下生活， 它还可以使你的大脑免受 无法治愈的疾病侵袭。 从而改变你人生的轨迹， 让它变得更好。

trajectory
n.轨道

incurable
adj.不能治愈的