How does Biles have such incredible balance? A scientist weighs in

By Rachel Feltman, Washington Post on 08.04.16
Word Count **729**

Simone Biles competes on the balance beam at the U.S. women's gymnastic championships Aug. 15, 2015, in Indianapolis, Indiana. She won the balance beam portion of the competition. Photo: AP Photo/AJ Mast

As the summer Olympics begin, all eyes will be on Simone Biles. The 19-year-old gymnast is one of the most decorated in history. But while Biles has clearly benefited from years of intense training, she's also a natural talent who copied seasoned gymnasts with ease as a small child. For those of us who seem to trip whenever the wind picks up, flipping up and down a balance beam can seem like a truly impossible task. What goes on in the brain and the body when athletes such as Biles perform these astounding feats - and why are they so much better at it than the rest of us?

"There are so many athletic tasks that are simply breathtaking in their execution," Thomas M. Jessell, co-director of Columbia University's Mortimer B. Zuckerman Mind Brain Behavior Institute, told The Post. Jessell has dedicated his career to studying the neuroscience of movement, but he still can't say what makes a Michael Jordan different from a Biles - or what makes elite athletes in general different from the rest of the population, other than hours of practice and je ne sais quoi.

In fact, scientists are only just starting to understand the brain-body communication that goes into even the most basic movements. We barely understand how the human body manages to coordinate the placement of one foot in front of the other, let alone how it all works when a balance beam comes into play.

"We have a primitive sense of how it all works, but if you were to show me the nervous system of Simone Biles and my own side-by-side, I couldn't tell you what was behind Simon's remarkable gymnastic capacity and my own clunkiness," Jessell said. He suspects that athletes like Biles have some combination of innately better "wiring" in their nervous systems and an ability to improve motor skills over time, but that's as far as he and his colleagues have gotten.

In some ways, Jessell explained, movement is simple - the brain really only has three tasks. It extracts information from the sensory world, stores it, and retrieves it as necessary. But in practice, this is incredibly complicated. The body has to know exactly where it's located at all times, with sensory nerves in the skin and muscles sending constant relays back to the brain. Visual information from the eyes helps an athlete track the body's location in motion - while it tumbles over a slim beam, for instance. Based on the realtime information and info stored from past experiences, the nervous system makes split-second adjustments to keep every muscle in the body exactly where it's meant to be.

It's possible that individuals who can become exceptionally adept at some of these movements - violinists, dancers, gymnasts, tightrope walkers, and so on - have bits and pieces of this complex network that are somehow more robust than average. But there might not be a universal strength shared by all talented gymnasts, let alone by all talented movers. Until we actually understand how movement and balance work, it's hard to say what physical characteristics might make one nervous system "better" than another.

Jessell's recent work suggests that there are some 200 classes of nerve cells associated with movement, which is, in his own words, "a frightening number to comprehend." To understand the nervous system, scientists will have to study each and every one and figure out its function.

"It's a daunting task," he said. "So what you do is you just pick a neuron to focus on, and if you pick it well, you can reveal really remarkable things."

Scientists quickly grow passionate about the little pieces of the system they study, Jessell said, but every single class of nerve cell matters. Knocking out one type or another from mouse subjects can help scientists learn how they work and why they're important, but there's a lot of work to plow through before they've looked at the entire process.

To Jessell, answering these questions is essential - and not just because he'd like to know how Biles manages her amazing twists and turns. To him, movement is the most basic expression of animal behavior.

"People have said that the difference between plant and animals is our ease of movement," Jessell said. We may only notice our innate grace when it fails us, but this constant synchronicity of the brain and body is always hard at work.

Quiz

1 Read the paragraph below from the article.

> *"There are so many athletic tasks that are simply breathtaking in their execution," Thomas M. Jessell, co-director of Columbia University's Mortimer B. Zuckerman Mind Brain Behavior Institute, told The Post. Jessell has dedicated his career to studying the neuroscience of movement, but he still can't say what makes a Michael Jordan different from a Biles - or what makes elite athletes in general different from the rest of the population, other than hours of practice and je ne sais quoi.*

Which conclusion is BEST supported by the paragraph?

(A) Thomas M. Jessell became interested in studying the neuroscience of movement because of his admiration for elite athletes.

(B) Thomas M. Jessell's career, spent studying the neuroscience of movement, has primarily focused on the movements of elite athletes Michael Jordan and Simone Biles.

(C) Thomas M. Jessell has devoted his career in the neuroscience of movement to better understanding why people consider elite athletes' movements to be breathtaking to watch.

(D) Thomas M. Jessell's career, spent studying the neuroscience of movement. has yet to produce answers to some questions he has, such as why elite athletes Michael Jordan and Simone Biles are different from other people.

2 Which of these matters is left uncertain in the article?

(A) whether practice is a factor that contributes to the ability of an athlete to move well

(B) whether visual information from the eyes helps an athlete to move well

(C) whether there are characteristics of the nervous systems that make one system better than another in terms of movement

(D) whether it is necessary in the study of movement to study every single class of nerve cell that is associated with movement

3 Which excerpt from the article BEST summarizes a central idea of it?

(A) As the Summer Olympics begin, all eyes will be on Simone Biles. The 19-year-old gymnast is one of the most decorated in history. But while Biles has clearly benefited from years of intense training, she's also a natural talent who copied seasoned gymnasts with ease as a small child.

(B) In fact, scientists are only just starting to understand the brain-body communication that goes into even the most basic movements. We barely understand how the human body manages to coordinate the placement of one foot in front of the other, let alone how it all works when a balance beam comes into play.

(C) In some ways, Jessell explained, movement is simple - the brain really only has three tasks. It extracts information from the sensory world, stores it, and retrieves it as necessary. But in practice, this is incredibly complicated. The body has to know exactly where it's located at all times, with sensory nerves in the skin and muscles sending constant relays back to the brain.

(D) People have said that the difference between plant and animals is our ease of movement," Jessell said. We may only notice our innate grace when it fails us, but this constant synchronicity of the brain and body is always hard at work.

4 Which statement accurately represents the relationship between the article's CENTRAL ideas?

(A) Simone Biles is able to perform astounding feats as a gymnast, but scientists still have no clue as to why she can move so well.

(B) While some scientists think that individuals who are particularly adept at movement have robust nervous systems, others believe that such individuals have a greater number of nerve cells associated with movement.

(C) As a scientist interested in the neuroscience of movement, Thomas M. Jessell has been studying the brains of elite athletes such as Simone Biles and Michael Jordan. His research has found that their brains are able to store and access more information than the brains of non-athletes.

(D) Some people are able to move much better than other people, and scientists think this is most likely a result of the way their nervous system operates.