

1

DIRECTIONS

Each passage or pair of passages below is followed by a number of questions. After reading each passage or pair, choose the best answer to each question based on what is stated or implied in the passage or passages and in any accompanying graphics (such as a table or graph).

1

Questions 42-52 are based on the following passage.

This passage is adapted from Joshua Foer, *Moonwalking with Einstein: The Art and Science of Remembering Everything*. ©2011 by Joshua Foer.

In 2000, a neuroscientist at University College London named Eleanor Maguire wanted to find out what effect, if any, all that driving around the labyrinthine streets of London might have on
 5 cabbies' brains. When she brought sixteen taxi drivers into her lab and examined their brains in an MRI scanner, she found one surprising and important difference. The right posterior hippocampus, a part of the brain known to be
 10 involved in spatial navigation, was 7 percent larger than normal in the cabbies—a small but very significant difference. Maguire concluded that all of that way-finding around London had physically altered the gross structure of their brains. The more
 15 years a cabbie had been on the road, the more pronounced the effect.

The brain is a mutable organ, capable—within limits—of reorganizing itself and readapting to new kinds of sensory input, a phenomenon known as
 20 neuroplasticity. It had long been thought that the adult brain was incapable of spawning new neurons—that while learning caused synapses to rearrange themselves and new links between brain cells to form, the brain's basic anatomical structure
 25 was more or less static. Maguire's study suggested the old inherited wisdom was simply not true.

After her groundbreaking study of London cabbies, Maguire decided to turn her attention to mental athletes. She teamed up with Elizabeth
 30 Valentine and John Wilding, authors of the academic monograph *Superior Memory*, to study ten individuals who had finished near the top of the World Memory Championship. They wanted to find out if the memorizers' brains were—like the London
 35 cabbies'—structurally different from the rest of ours, or if they were somehow just making better use of memory abilities that we all possess.

The researchers put both the mental athletes and a group of matched control subjects into MRI scanners
 40 and asked them to memorize three-digit numbers, black-and-white photographs of people's faces, and magnified images of snowflakes, while their brains were being scanned. Maguire and her team thought it was possible that they might discover anatomical
 45 differences in the brains of the memory champs,

evidence that their brains had somehow reorganized themselves in the process of doing all that intensive remembering. But when the researchers reviewed the imaging data, not a single significant structural
 50 difference turned up. The brains of the mental athletes appeared to be indistinguishable from those of the control subjects. What's more, on every single test of general cognitive ability, the mental athletes' scores came back well within the normal range. The
 55 memory champs weren't smarter, and they didn't have special brains.

But there was one telling difference between the brains of the mental athletes and the control subjects: When the researchers looked at which parts of the
 60 brain were lighting up when the mental athletes were memorizing, they found that they were activating entirely different circuitry. According to the functional MRIs [fMRIs], regions of the brain that were less active in the control subjects seemed to be
 65 working in overdrive for the mental athletes.

Surprisingly, when the mental athletes were learning new information, they were engaging several regions of the brain known to be involved in
 70 two specific tasks: visual memory and spatial navigation, including the same right posterior hippocampal region that the London cabbies had enlarged with all their daily way-finding. At first glance, this wouldn't seem to make any sense. Why would mental athletes be conjuring images in
 75 their mind's eye when they were trying to learn three-digit numbers? Why should they be navigating like London cabbies when they're supposed to be remembering the shapes of snowflakes?

Maguire and her team asked the mental athletes
 80 to describe exactly what was going through their minds as they memorized. The mental athletes said they were consciously converting the information they were being asked to memorize into images, and distributing those images along familiar spatial
 85 journeys. They weren't doing this automatically, or because it was an inborn talent they'd nurtured since childhood. Rather, the unexpected patterns of neural activity that Maguire's fMRIs turned up were the result of training and practice.

42

According to the passage, Maguire's findings regarding taxi drivers are significant because they

- A) demonstrate the validity of a new method.
- B) provide evidence for a popular viewpoint.
- C) call into question an earlier consensus.
- D) challenge the authenticity of previous data.

43

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 8-12 ("The right . . . difference")
- B) Lines 12-16 ("Maguire . . . effect")
- C) Lines 17-20 ("The brain . . . neuroplasticity")
- D) Lines 20-26 ("It had . . . true")

44

As used in line 24, "basic" most nearly means

- A) initial.
- B) simple.
- C) necessary.
- D) fundamental.

45

Which question was Maguire's study of mental athletes primarily intended to answer?

- A) Does the act of memorization make use of different brain structures than does the act of navigation?
- B) Do mental athletes inherit their unusual brain structures, or do the structures develop as a result of specific activities?
- C) Does heightened memorization ability reflect abnormal brain structure or an unusual use of normal brain structure?
- D) What is the relationship between general cognitive ability and the unusual brain structures of mental athletes?

46

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 27-29 ("After . . . athletes")
- B) Lines 33-37 ("They . . . possess")
- C) Lines 38-43 ("The researchers . . . scanned")
- D) Lines 52-54 ("What's . . . range")

47

As used in line 39, “matched” most nearly means

- A) comparable.
- B) identical.
- C) distinguishable.
- D) competing.

48

The main purpose of the fifth paragraph (lines 57-65) is to

- A) relate Maguire’s study of mental athletes to her study of taxi drivers.
- B) speculate on the reason for Maguire’s unexpected results.
- C) identify an important finding of Maguire’s study of mental athletes.
- D) transition from a summary of Maguire’s findings to a description of her methods.

49

According to the passage, when compared to mental athletes, the individuals in the control group in Maguire’s second study

- A) showed less brain activity overall.
- B) demonstrated a wider range of cognitive ability.
- C) exhibited different patterns of brain activity.
- D) displayed noticeably smaller hippocampal regions.

50

The passage most strongly suggests that mental athletes are successful at memorization because they

- A) exploit parts of the brain not normally used in routine memorization.
- B) convert information they are trying to memorize into abstract symbols.
- C) organize information into numerical lists prior to memorization.
- D) exercise their brains regularly through puzzles and other mental challenges.

51

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 66-72 (“Surprisingly . . . way-finding”)
- B) Lines 72-73 (“At first . . . sense”)
- C) Lines 79-81 (“Maguire . . . memorized”)
- D) Lines 85-87 (“They . . . childhood”)

52

The questions in lines 74-78 primarily serve to

- A) raise doubts about the reliability of the conclusions reached by Maguire.
- B) emphasize and elaborate on an initially puzzling result of Maguire’s study of mental athletes.
- C) imply that Maguire’s findings undermine earlier studies of the same phenomenon.
- D) introduce and explain a connection between Maguire’s two studies and her earlier work.

STOP

If you finish before time is called, you may check your work on this section only.

Do not turn to any other section.

TLC Stamp

