

Being Left-handed in a Right-handed World



The world is designed for right-handed people. Why does a tenth of the population prefer the left?

A The probability that two right-handed people would have a left-handed child is only about 9.5 percent. The chance rises to 19.5 percent if one parent is a lefty and 26 percent if both parents are left-handed. The preference, however, could also stem from an infant's imitation of his parents. To test genetic influence, starting in the 1970s British biologist Marian Annett of the University of Leicester hypothesized that no single gene determines handedness. Rather, during fetal development, a certain molecular factor helps to strengthen the brain's left hemisphere, which increases the probability that the right hand will be dominant, because the left side of the brain controls the right side of the body, and vice versa. Among the minority of people who lack this factor, handedness develops entirely by chance. Research conducted on twins complicates the theory, however. One in five sets of identical twins involves one right-handed and one left-handed person, despite the fact that their genetic material is the same. Genes, therefore, are not solely responsible for handedness.

B Genetic theory is also undermined by results from Peter Hepper and his team at Queen's University in Belfast, Ireland. In 2004 the psychologists used ultrasound to show that by the 15th week of pregnancy, fetuses already have a preference as to which thumb they suck. In most cases, the preference continued after birth. At 15 weeks, though, the brain does not yet have control over the body's limbs. Hepper speculates that fetuses tend to prefer whichever side of the body is developing quicker and that their movements, in turn, influence the brain's development. Whether this early preference is temporary or holds up throughout development and infancy is unknown. Genetic predetermination is also contradicted by the widespread observation that children do not settle on either their right or left hand until they are two or three years old.

C But even if these correlations were true, they did not explain what actually causes left-handedness. Furthermore, specialization on either side of the body is common among animals. Cats will favor one paw over another when fishing toys out from under the couch. Horses stomp more frequently with one hoof than the other. Certain crabs motion predominantly with the left or right claw. In evolutionary terms, focusing power and dexterity in one limb is more efficient than having to train two, four or even eight limbs equally. Yet for most animals, the preference for one side or the other is seemingly random. The overwhelming dominance of the right hand is associated only with humans. That fact directs attention toward the brain's two hemispheres and perhaps toward language.

D Interest in hemispheres dates back to at least 1836. That year, at a medical conference, French physician Marc Dax reported on an unusual commonality among his patients. During his many years as a country doctor, Dax had encountered more than 40 men and women for whom speech was difficult, the result of some kind of brain damage. What was unique was that every individual suffered damage to the left side of the brain. At the conference, Dax elaborated on his theory, stating that each half of the brain was responsible for certain functions and that the left hemisphere controlled speech. Other experts showed little interest in the Frenchman's ideas. Over time, however, scientists found more and more evidence of people experiencing speech difficulties following injury to the left brain. Patients with damage to the right hemisphere most often displayed disruptions in perception or concentration. Major advancements in understanding the brain's asymmetry were made in the 1960s as a result of so-called split-brain surgery, developed to help patients with epilepsy. During this operation, doctors severed the corpus callosum—the nerve bundle that connects the two hemispheres. The surgical cut also stopped almost all normal communication between the two hemispheres, which offered researchers the opportunity to investigate each side's activity.

E In 1949 neurosurgeon Juhn Wada devised the first test to provide access to the brain's functional organization of language. By injecting an anesthetic into the right or left carotid artery, Wada temporarily paralyzed one side of a healthy brain, enabling him to more closely study the other side's capabilities. Based on this approach, Brenda Milner and the late Theodore Rasmussen of the Montreal Neurological Institute published a major study in 1975 that confirmed the theory that country doctor Dax had formulated nearly 140 years earlier: in 96 percent of right-handed people, language is processed much more intensely in the left hemisphere. The correlation is not as clear in lefties, however. For two thirds of them, the left hemisphere is still the most active language processor. But for the remaining third, either the right side is dominant or both sides work equally, controlling different language functions. That last statistic has slowed acceptance of the notion that the predominance of right-handedness is driven by left-hemisphere dominance in language processing. It is not at all clear why language control should somehow have dragged the control of body movement with it. Some experts think one reason the left hemisphere reigns over language is because the organs of speech processing—the larynx and tongue

—are positioned on the body's symmetry axis. Because these structures were centered, it may have been unclear, in evolutionary terms, which side of the brain should control them, and it seems unlikely that shared operation would result in smooth motor activity.

Language and handedness could have developed preferentially for very different reasons as well. For example, some researchers, including evolutionary psychologist Michael C. Corballis of the University of Auckland in New Zealand, think that the origin of human speech lies in gestures. Gestures predated words and helped language emerge. If the left hemisphere began to dominate speech, it would have dominated gestures, too, and because the left brain controls the right side of the body, the right hand developed more strongly.

F Perhaps we will know more soon. In the meantime, we can revel in what, if any, differences handedness brings to our human talents. Popular wisdom says right-handed, left-brained people excel at logical, analytical thinking. Lefthanded, right-brained individuals are thought to possess more creative skills and may be better at combining the functional features emergent in both sides of the brain. Yet some neuroscientists see such claims as pure speculation. Fewer scientists are ready to claim that left-handedness means greater creative potential. Yet lefties are prevalent among artists, composers and the generally acknowledged great political thinkers. Possibly if these individuals are among the lefties whose language abilities are evenly distributed between hemispheres, the intense interplay required could lead to unusual mental capabilities.

G Or perhaps some lefties become highly creative simply because they must be more clever to get by in our right-handed world. This battle, which begins during the very early stages of childhood, may lay the groundwork for exceptional achievements.

Questions 1-5

Reading Passage has seven sections A-G.

Which section contains the following information?

Write the correct letter A-G in boxes 1-5 on your answer sheet.

- 1 _____ Preference of using one side of the body in animal species.
- 2 _____ How likely one-handedness is born.
- 3 _____ The age when the preference of using one hand is settled.
- 4 _____ Occupations usually found in left-handed population.
- 5 _____ A reference to an early discovery of each hemisphere's function.

Questions 6-9

Look at the following researchers (Questions 6-9) and the list of findings below.

Match each researcher with the correct finding.

Write the correct letter **A-G** in boxes **6-9** on your answer sheet.

List of Findings

- A** Early language evolution is correlated to body movement and thus affecting the preference of use of one hand.
- B** No single biological component determines the handedness of a child.
- C** Each hemisphere of the brain is in charge of different body functions.
- D** Language process is mainly centered in the left-hemisphere of the brain.
- E** Speech difficulties are often caused by brain damage.
- F** The rate of development of one side of the body has influence on hemisphere preference in fetus.
- G** Brain function already matures by the end of the fetal stage.

6 _____ Marian Annett

7 _____ Peter Hepper

8 _____ Brenda Milner & Theodore Rasmussen

9 _____ Michael Corballis

Questions 10-13

Do the following statements agree with the information given in Reading Passage?

In boxes **10-13** on your answer sheet write

YES if the statement agrees with the information

NO if the statement contradicts the information

NOT GIVEN if there is no information on this

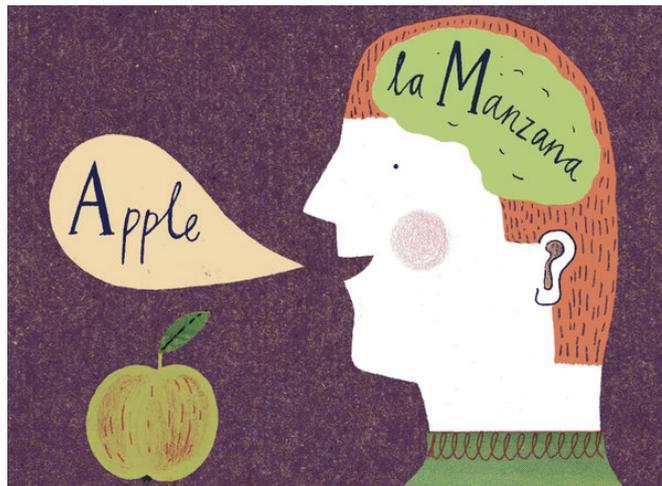
10 _____ The study of twins shows that genetic determination is not the only factor for left-handedness.

11 _____ Marc Dax's report was widely accepted in his time.

12 _____ Juhn Wada based his findings on his research of people with language problems.

13 _____ There tend to be more men with left-handedness than women.

The Benefits of Being Bilingual



A. According to the latest figures, the majority of the world's population is now bilingual or multilingual, having grown up speaking two or more languages. In the past, such children were considered to be at a disadvantage compared with their monolingual peers. Over the past few decades, however, technological advances have allowed researchers to look more deeply at how bilingualism interacts with and changes the cognitive and neurological systems, thereby identifying several clear benefits of being bilingual.

B. Research shows that when a bilingual person uses one language, the other is active at the same time. When we hear a word, we don't hear the entire word all at once: the sounds arrive in sequential order. Long before the word is finished, the brain's language system begins to guess what that word might be. If you hear 'can', you will likely activate words like 'candy' and 'candle' as well, at least during the earlier stages of word recognition. For bilingual people, this activation is not limited to a single language; auditory input activates corresponding words regardless of the language to which they belong. Some of the most compelling evidence for this phenomenon, called 'language co-activation', comes from studying eye movements. A Russian-English bilingual asked to 'pick up a marker' from a set of objects would look more at a stamp than someone who doesn't know Russian, because the Russian word for 'stamp', *marka*, sounds like the English word he or she heard, 'marker'. In cases like this, language co-activation occurs because what the listener hears could map onto words in either language.

C. Having to deal with this persistent linguistic competition can result in difficulties, however. For instance, knowing more than one language can cause speakers to name pictures more slowly, and can increase 'tip-of-the-tongue states', when you can almost, but not quite, bring a word to mind. As a result, the constant juggling of two languages creates a need to control how much a person accesses a language at any given time. For this reason, bilingual people often perform better on tasks that require conflict management. In the classic Stroop Task, people see a word and are asked to name the colour of the word's font. When the colour and the word match (i., the word 'red' printed in red), people correctly name the colour more quickly than when the colour and the word don't match (i., the word 'red' printed in blue). This occurs because the word itself ('red') and its font colour

(blue) conflict. Bilingual people often excel at tasks such as this, which tap into the ability to ignore competing perceptual information and focus on the relevant aspects of the input. Bilinguals are also better at switching between two tasks; for example, when bilinguals have to switch from categorizing objects by colour (red or green) to categorizing them by shape (circle or triangle), they do so more quickly than monolingual people, reflecting better cognitive control when having to make rapid changes of strategy.

D. It also seems that the neurological roots of the bilingual advantage extend to brain areas more traditionally associated with sensory processing. When monolingual and bilingual adolescents listen to simple speech sounds without any intervening background noise, they show highly similar brain stem responses. When researchers play the same sound to both groups in the presence of background noise, however, the bilingual listeners' neural response is considerably larger, reflecting better encoding of the sound's fundamental frequency, a feature of sound closely related to pitch perception.

E. Such improvements in cognitive and sensory processing may help a bilingual person to process information in the environment, and help explain why bilingual adults acquire a third language better than monolingual adults master a second language. This advantage may be rooted in the skill of focussing on information about the new language while reducing interference from the languages they already know.

F. Research also indicates that bilingual experience may help to keep the cognitive mechanisms sharp by recruiting alternate brain networks to compensate for those that become damaged during aging. Older bilinguals enjoy improved memory relative to monolingual people, which can lead to real-world health benefits. In a study of over 200 patients with Alzheimer's disease, a degenerative brain disease, bilingual patients reported showing initial symptoms of the disease an average of five years later than monolingual patients. In a follow-up study, researchers compared the brains of bilingual and monolingual patients matched on the severity of Alzheimer's symptoms. Surprisingly, the bilinguals' brains had more physical signs of disease than their monolingual counterparts, even though their outward behaviour and abilities were the same. If the brain is an engine, bilingualism may help it to go farther on the same amount of fuel.

G. Furthermore, the benefits associated with bilingual experience seem to start very early. In one study, researchers taught seven-month-old babies growing up in monolingual or bilingual homes that when they heard a tinkling sound, a puppet appeared on one side of a screen. Halfway through the study, the puppet began appearing on the opposite side of the screen. In order to get a reward, the infants had to adjust the rule they'd learned; only the bilingual babies were able to successfully learn the new rule. This suggests that for very young children, as well as for older people, navigating a multilingual environment imparts advantages that transfer far beyond language.

Questions 1-5

Complete the table below.

Choose **NO MORE THAN TWO WORDS** from the passage for each answer.
Write your answers in boxes **1-5** on your answer sheet.

Test	Findings
Observing the 1 _____ of Russian-English bilingual people when asked to select certain objects	Bilingual people engage both languages simultaneously: a mechanism known as 2 _____
A test called the 3 _____ , focusing on naming colours	Bilingual people are more able to handle tasks involving a skill called 4 _____
A test involving switching between tasks	When changing strategies, bilingual people have superior 5 _____

Questions 6-10

Do the following statements agree with the claims of the writer in Reading Passage?

In boxes **6-10** on your answer sheet, write

YES if the statement agrees with the claims of the writer

NO if the statement contradicts the claims of the writer

NOT GIVEN if it is impossible to say what the writer thinks about this

6 _____ Attitudes towards bilingualism have changed in recent years.

7 _____ Bilingual people are better than monolingual people at guessing correctly what words are before they are finished.

8 _____ Bilingual people consistently name images faster than monolingual people.

9 _____ Bilingual people's brains process single sounds more efficiently than monolingual people in all situations.

10 _____ Fewer bilingual people than monolingual people suffer from brain disease in old age.

Questions 11-14

Reading Passage has seven paragraphs, A-G.

Which paragraph contains the following information?

Write the correct letter, A-G, in boxes 11-14 on your answer sheet.

11 _____ an example of how bilingual and monolingual people's brains respond differently to a certain type of non-verbal auditory input

12 _____ a demonstration of how a bilingual upbringing has benefits even before we learn to speak

13 _____ a description of the process by which people identify words that they hear

14 _____ reference to some negative consequences of being bilingual

The Intersection of Health Sciences and Geography



A While many diseases that affect humans have been eradicated due to improvements in vaccinations and the availability of healthcare, there are still areas around the world where certain health issues are more prevalent. In a world that is far more globalised than ever before, people come into contact with one another through travel and living closer and closer to each other. As a result, super-viruses and other infections resistant to antibiotics are becoming more and more common.

B Geography can often play a very large role in the health concerns of certain populations. For instance, depending on where you live, you will not have the same health concerns as someone who lives in a different geographical region. Perhaps one of the most obvious examples of this idea is malaria-prone areas, which are usually tropical regions that foster a warm and damp environment in which the mosquitos that can give people this disease can grow. Malaria is much less of a problem in high-altitude deserts, for instance.

C In some countries, geographical factors influence the health and well-being of the population in very obvious ways. In many large cities, the wind is not strong enough to clear the air of the massive amounts of smog and pollution that cause asthma, lung problems, eyesight issues and more in the people who live there. Part of the problem is, of course, the massive number of cars being driven, in addition to factories that run on coal power. The rapid industrialisation of some countries in recent years has also led to the cutting down of forests to allow for the expansion of big cities, which makes it even harder to fight the pollution with the fresh air that is produced by plants.

D It is in situations like these that the field of health geography comes into its own. It is an increasingly important area of study in a world where diseases like polio are re-emerging, respiratory diseases continue to spread, and malaria-prone areas are still fighting to find a better cure. Health geography is the combination of, on the one hand, knowledge regarding geography and methods used to analyse and interpret geographical information, and on the other, the study of health, diseases and healthcare practices around the world. The aim of this hybrid science is to create solutions for common geography-based health problems. While people will always be prone to illness, the study of how geography affects

our health could lead to the eradication of certain illnesses, and the prevention of others in the future. By understanding why and how we get sick, we can change the way we treat illness and disease specific to certain geographical locations.

E The geography of disease and ill health analyses the frequency with which certain diseases appear in different parts of the world, and overlays the data with the geography of the region, to see if there could be a correlation between the two. Health geographers also study factors that could make certain individuals or a population more likely to be taken ill with a specific health concern or disease, as compared with the population of another area. Health geographers in this field are usually trained as healthcare workers, and have an understanding of basic epidemiology as it relates to the spread of diseases among the population.

F Researchers study the interactions between humans and their environment that could lead to illness (such as asthma in places with high levels of pollution) and work to create a clear way of categorising illnesses, diseases and epidemics into local and global scales. Health geographers can map the spread of illnesses and attempt to identify the reasons behind an increase or decrease in illnesses, as they work to find a way to halt the further spread or re-emergence of diseases in vulnerable populations.

G The second subcategory of health geography is the geography of healthcare provision. This group studies the availability (of lack thereof) of healthcare resources to individuals and populations around the world. In both developed and developing nations there is often a very large discrepancy between the options available to people in different social classes, income brackets, and levels of education. Individuals working in the area of the geography of healthcare provision attempt to assess the levels of healthcare in the area (for instance, it may be very difficult for people to get medical attention because there is a mountain between their village and the nearest hospital). These researchers are on the frontline of making recommendations regarding policy to international organisations, local government bodies and others.

H The field of health geography is often overlooked, but it constitutes a huge area of need in the fields of geography and healthcare. If we can understand how geography affects our health no matter where in the world we are located, we can better treat disease, prevent illness, and keep people safe and well.

Questions 1-6

Reading Passage has eight sections, **A-H**. Which paragraph contains the following information? Write the correct letter, **A-H**, in boxes **1-6** on your answer sheet

NB You may use any letter **more than once**.

- 1 _____ an acceptance that not all diseases can be totally eliminated
- 2 _____ examples of physical conditions caused by human behaviour
- 3 _____ a reference to classifying diseases on the basis of how far they extend geographically
- 4 _____ reasons why the level of access to healthcare can vary within a country
- 5 _____ a description of health geography as a mixture of different academic fields
- 6 _____ a description of the type of area where a particular illness is rare

Questions 7-13

Complete the sentences below.

Choose **ONE WORD ONLY** from the passage for each answer.

- 7 Certain diseases have disappeared, thanks to better _____ and healthcare.
- 8 Because there is more contact between people, _____ are losing their usefulness.
- 9 Disease-causing _____ are most likely to be found in hot, damp regions.
- 10 One cause of pollution is _____ that burn a particular fuel.
- 11 The growth of cities often has an impact on nearby _____
- 12 _____ is one disease that is growing after having been eradicated.
- 13 A physical barrier such as a _____ can prevent people from reaching a hospital.

