國立成功大學 106 學年度碩士班招生考試試題

系　　所：心理學系

考試科目：英文閱讀測驗

考試日期：0213，節次：4

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

A. Reading Comprehension: There will be 6 short articles and 5 questions after each article. Please identify the choice that best answers the question. (30 questions, 2 points each, total 60 points for Part A)

Q 1-5 are based on a 'News & Comment" article in Nature on Dec. 22, 2016.

A test that records the way the brain processes sound might provide a simple and reliable measure of concussion, a small study suggests. If the method works, it could help scientists work out how best to treat the poorly understood brain injury.

In a paper published on 22 December in *Scientific Reports*, neuroscientist Nina Kraus of Northwestern University in Evanston, Illinois, and other researchers say that they have found that a particular signal in neural activity, recorded with electrodes placed on the head as children listen to 'da' sounds from a speech synthesizer, can objectively demarcate concussed children from a healthy control group. The research was done on just 40 people — a tiny group — and will have to be repeated in larger samples. But other researchers are still excited by the report, because concussion is hard to diagnose, particularly in children.

The study "may for the first time offer a simple and objective biomarker to measure the severity of brain injuries", says Thomas Wisniewski, a neurologist at New York University's Langone Medical Center. There is intense interest in finding a clear-cut biological signature for concussion, he says. "We have been crying out for a reliable method."

Millions of people enter hospitals every year with blows to the head, and some of have concussion, a minor brain injury that can betoken more serious damage. To diagnose it, physicians rely on subjective complaints of dizziness, coordination tests and sometimes more involved procedures, such as magnetic resonance imaging (MRI) or computed tomography (CT) scans. But there's no single objective way to detect concussion and measure its severity — and no simple test that can be administered regularly to determine when someone has recovered, a particularly important issue for athletes keen to be allowed back on the field.

Besides brain scans, some companies have tried searching for particular proteins in the blood released after brain injuries — but haven't yet shown unambiguous proof that these are a consistent measure of concussion, Wisniewski says. And even if blood tests do work, they are hard to justify for young children who have hit their heads, notes trauma surgeon Christian Kammerlander of the university hospital at the Ludwig Maximilian University of Munich in Germany. "We always try to avoid the drama of taking blood from young children after a traumatic accident."

Researchers are particularly interested in finding a way to track concussion in children, to measure its long-term effects on brain health. But children are difficult to diagnose with concussion, because they often report their symptoms less clearly than adults.

Kraus thought that measuring brain activity in response to sound might provide an objective measure of the problem, because concussed people can find it hard to process sounds in noisy environments. She worked with Cynthia LaBella, a sports doctor at the Ann & Robert H. Lurie Children's Hospital of Chicago in Illinois, to study the brain activity of 20 children aged between 11 and 15, four weeks after clinicians had pronounced

them to be concussed following sports accidents. The team compared the results with the brain activity of healthy children.

Kraus says that her team picked out an objective neural signature that correctly identified 90% (18 out of 20) of the concussed children, and ruled out 95% (19 out of 20) of the healthy control group. "The sensitivity is impressive," says Wisniewski, "even though the number of children in the study is very small." The impairment seemed to be most pronounced in the children with the most serious symptoms. And when some of the children returned to the clinic and reported improvements — such as fewer episodes of dizziness or less difficulty concentrating — their neural responses to sound likewise improved.

Much more work needs to be done on larger groups of people, says Kraus. Her team is now testing the auditory responses of athletes immediately after head injury and several weeks later. She hopes to commercialize her research, and is working with colleagues to reduce the cost and size of the hardware required, to create a concussion-detection kit for use in labs or at sports grounds.

1. According to the text, physicians currently rely on which response of patient to diagnose concussion? (A) complaints of dizziness. (B) skull wounds. (C) proteins in the blood. (D) coordination tests. (E) A & C.
2. According to the text, what would be the most promising and objective biomarker to measure the severity of brain injuries, especially in children? (A) coordination tests. (B) proteins in the blood. (C) fMRI. (D) brain neural activity in response to sound. (E) loudness of their cries.
3. According to the text, why develop an objective and reliable method to detect concussion and measure its severity is imperative? (A) Concussion can betoken more serious damage. (B) Injured athletes need to know when they can be back on the field. (C) Current diagnosis methods are too expensive. (D) It could help scientists work out how best to treat the poorly understood brain injury. (E) A, B & D.
4. According to Dr. Kraus, what percentage an objective neural signature can correctly identified the concussed children? (A) 95%. (B) 90% (C) 100%. (D) 50%. (E) 80%.
5. Why Dr. Kraus thought that measuring brain activity in response to sound might provide an objective measure of concussion? (A) Concussed people usually find it hard to process sounds in noisy environments. (B) Concussed people have sharp audition. (C) Concussed people have headaches. (D) Concussed people have good vision. (E) Concussed people have difficulty speaking.

Q 6-10 are based on a 'News & Comment" article in Nature on Sep. 29, 2016.

A reported world-first in fertility therapy — a baby boy conceived using a controversial technique that mixes DNA from three people — has made headlines across the world. But with no way of verifying the claim because the specialists behind the procedure will not release data until October, some researchers are questioning the ethics of the procedure. In particular, they ask why the US-based team behind the operation chose to carry it out in Mexico, a country with less-clear oversight of human-embryo modification than, for instance, the United Kingdom or the United States.

Researchers at the New Hope Fertility Center in New York City told *New Scientist* — which broke the news on 27 September — that they had conducted the procedure for a Jordanian couple, and that the baby boy was born in April. The team, led by John Zhang, a physician at the centre, is not due to present details until 19 October, at the American Society for Reproductive Medicine meeting in Salt Lake City, Utah, but it has published an abstract online with sparse information.

According to the abstract, the boy's mother carries a rare disease called Leigh syndrome, a neurological disorder caused by faulty mitochondria, the cell's energy-producing structures. The couple lost two children to the disease before asking for the clinic's help.

In an attempt to create embryos without the mother's faulty mitochondria, the clinic's team transferred the nucleus of the mother's egg cell to the egg of a donor with healthy mitochondria and its nucleus removed — a technique known as spindle nuclear transfer — and then fertilized it with the father's sperm, the team reports in the abstract. Zhang's team modified five embryos, one of which was implanted into the mother and survived to birth. That baby inherited nuclear DNA from both parents and mitochondrial DNA from the donor.

Her son's birth in April caps nearly three decades of efforts to manipulate mitochondria and produce healthy eggs — initially to overcome fertility problems and now to avoid passing on disease. Although it takes three people to make these fertilized eggs, some researchers take issue with the moniker "three-parent baby." Pioneering clinical embryologist Jacques Cohen calls the term erroneous. Mitochondrial DNA doesn't contribute to a person's traits, so a mitochondrial donor hardly constitutes a parent, he says.

Although other 'three-parent' babies were born in the 1990s, they were created using a different technique in which mitochondria and other cellular material from the eggs of healthy donors were transferred into the eggs of the mothers, which were then fertilized with the fathers' sperm.

So the achievement of Zhang team's, if verified, would represent the first child conceived using the spindle-transfer version of mitochondrial-replacement therapy (MRT). In the United States, MRT is in principle allowed, but requires review and approval by the US Food and Drug Administration (FDA). Last year, Congress banned the FDA from using federal funds to review proposals that would manipulate the genetics of human embryos — hamstringing the agency. Lawmakers seem poised to continue the funding ban into the 2017 fiscal year. The United Kingdom, meanwhile, decided last year to allow MRT under licence.

Embryologist Jacques Cohen, who carried out mitochondrial-transfer procedures in the 1990s and is now laboratory director of the biotechnology company Reprogenetics in Livingston, New Jersey, was a regulatory adviser on Zhang's study, and welcomes the news that the spindle-transfer method seems to be effective. "I think the world is ready to try this out. It has been discussed for a long time," he says. "I think there are risks, but that's what happens when you do experimental procedure for the first time."

Cohen's clinic produced 17 babies before the US began to regulate MRT in 2002. He has recently followed up with 13 of the children from his study — now teenagers — and is about to publish an article about their outcomes. Although he declines to give details, Cohen says that they have no obvious health problems. But some other researchers are troubled by Zhang's announcement. "They just went ahead and did it," says David

Clancy, who studies mitochondrial biology at Lancaster University, UK. "The number of issues that are still unresolved — it's just staggering."

Among the unknowns is the possibility that the technique could transfer some diseased mitochondria from the mother into the donor egg along with the nucleus. According to Zhang's abstract, 5% of the embryo's mitochondrial DNA was the mother's, carried over along with the nucleus — but mitochondrial DNA samples taken from the baby after birth varied from tissue to tissue and suggested a level of faulty DNA that was, on average, 1.6%.

Cohen says that it is generally thought that no symptoms will occur if fewer than about 20% of mitochondrial DNA are faulty. But Dietrich Egli, a stem-cell scientist at the New York Stem Cell Foundation who is also developing mitochondrial-transfer techniques, says that 5% at the embryo stage is 10 times higher than that seen in studies using spindle transfer on embryos not destined for implantation. As a result, he says, the technique "was not carried out well". "It is a remarkable step, but unfortunately it is not well done," he adds. Clancy notes that it is impossible to analyze mitochondria in a living human from organs such as the heart and brain, and that weak mitochondria would be particularly problematic in these organs.

6. According to the text, the first child conceived using the spindle-transfer version of mitochondrial-replacement therapy (MRT) is held in which country? (A) The United States. (B) The United Kingdom. (C) Mexico. (D) China. (E) Taiwan.
7. According to the text, the DNA of the 'three-parent baby' contains (A) nuclear DNA from both parents and mitochondrial DNA from the donor. (B) nuclear DNA from the mother and mitochondrial DNA from the father and donor. (C) mitochondrial DNA from both parents and the donor. (D) nuclear DNA from both parents and the donor. (E) None of above.
8. The word "hamstringing" in "Congress banned the FDA from using federal funds to review proposals that would manipulate the genetics of human embryos — hamstringing the agency." could be substituted by (A) laming. (B) encouraging. (C) helping. (D) engaging. (E) permitting
9. According to Dr. Cohen, fewer than what percentage of faulty mitochondrial DNA in a baby is considered safe? (A) 5% (B) 10% (C) 15% (D) 20% (E) 1.6%
10. According to Dr. Cohen, why the moniker "three-parent baby" is erroneous? (A) They baby is raised by two parents only. (B) Mitochondrial DNA of the donor doesn't contribute to the baby's personality. (C) Mitochondrial DNA of the mother is faulty. (D) Mitochondrial DNA of the mother doesn't contribute to the baby's personality. (E) The baby's personality is determined by both nature and nurture.

Q 11-15 are based on a 'News" article in Science on Dec. 19, 2016.

A first-of-its-kind study has revealed that the architecture of women's brains changes strikingly during their first pregnancies, in ways that last for at least 2 years. In particular, gray matter shrinks in areas involved in processing and responding to social signals. This may mean that new mothers' brains are more efficiently wired in areas that allow them, for instance, to respond to their infant's needs or to detect threatening people in their

environments. The changes correlated with standard tests of a mother's attachment to her infant—and they occurred whether a woman conceived naturally or using in vitro fertilization.

"We certainly don't want to put a message out there along the lines of 'pregnancy makes you lose your brain,'" says the study's lead author Elseline Hoekzema, a neuroscientist at Leiden University the Netherlands who is also the pregnant mother of a 2-year-old. "Gray matter volume loss can also represent a beneficial process of maturation or specialization."

Pregnancy is a time of dramatic, hormone-driven physiological and physical changes. Blood volume, hormone levels, absorption of nutrients, and other physiological capabilities grow dramatically. Other changes, according to anecdotal reports from pregnant women, are not so salubrious, like forgetfulness and difficulty concentrating. Whereas animal studies have shown that pregnancy is associated with apparently long-lasting anatomical brain changes—accompanied by adaptive changes, such as rodent mothers becoming better at foraging for food—virtually no studies have drilled down on anatomical changes in the human brain during pregnancy.

Hoekzema and her colleagues set out to change that. Working in Spain, in affiliation with the Autonomous University of Barcelona, they used MRI scanning to examine the brains of 25 women who had never had children, both before they became pregnant and again from 3 weeks to a few months after they gave birth. The team also scanned 19 first-time fathers at the same intervals, 17 men without children, and 20 women without children who did not become pregnant during the study. Then, they used computer-based analyses to measure changes in gray matter volume.

The findings showed highly consistent gray matter volume losses in the mothers and not in the other groups, the team reports today in *Nature Neuroscience*. The changes occurred primarily in areas of the brain involved in social tasks like reading the desires and intentions of others from their faces and actions. The hippocampus, a region associated with memory, also lost volume. What's more, the team found that the mothers' scores on a standard test that gauges the degree of a mom's attachment to her infant could be predicted to a significant degree based on the changes in their gray matter volume during pregnancy.

The scientists also used MRI scans to watch the women's brains work in real time, as they looked at photos of their own infants and of other babies. Several of the brain areas that had lost gray matter during pregnancy responded with the strongest neural activity to their own babies as opposed to the photos of other infants. (Comparisons between the brain's response to photos of a mother's own infant and to photos of other infants is a common measure researchers use to gauge neural responses to babies.)

Two years later, 11 of the 25 mothers—those who had not become pregnant again—returned for MRI scans. The scans showed that gray matter loss remained—except in the hippocampus, where most volume had been restored. The changes were so consistent that a computer algorithm could predict with 100% accuracy whether a woman had been pregnant from her MRI scan.

The researchers could not explain with certainty what the findings mean–they do not have the kind of access to the women's brains that scientists have to rodents', for instance—but they speculate that the gray matter losses might confer an adaptive advantage, Hoekzema says. She notes that a similar decline in gray matter

volume occurs during adolescence, when neural networks are fine-tuned for more efficiency and more specialized functions.

Scientists not involved in the study noted that not only is it the first to demonstrate widespread anatomical changes in the pregnant human brain, but that it goes further by showing that the changes last for at least 2 years. "It opens the door to the possibility that it might cause changes in parenting that might have implications in decision-making and behavior later in life," says Mel Rutherford, an evolutionary psychologist at McMaster University in Hamilton, Canada.

He adds that he would like to see similar studies in adoptive parents and in mothers who give up their children for adoption. That might strengthen the evidence from the current study that the changes arise solely from the physical fact of pregnancy and not, for instance, from the stress and sleep deprivation that all parents experience early in an infant's life. (In the current study, the brains of the new fathers did not change despite these stresses.)

Abbe Macbeth, a neuroscientist with Noldus Information Technology, a behavioral research consultancy in Leesburg, Virginia, and herself the mother of 6- and 9-year-olds, says that less can be more when the brain restructures itself to respond to life changes. "There is all this anecdotal talk about pregnant women forgetting things, but that can occur in areas that don't necessarily have anything to do with caring for our offspring," she says. "That's what nature wants us to focus on. This paper shows that."

11. According to the text, which population shows a decrease of gray matter volume: (A) Pregnant women. (B) Women in adolescence. (C) New fathers. (D) B & C. (E) A & B.
12. According to the text, gray matter losses could be a sign for (A) brain damage. (B) more efficient and specialized neural networks. (C) forgetfulness and difficulty concentrating. (D) stress and sleep deprivation. (E) marriage satisfaction.
13. According to the text, the changes of gray matter volume in pregnant women occurred primarily which areas of the brain? (A) The hippocampus. (B) The amygdala. (C) The brain areas involved in social tasks. (D) A & C. (E) All of above.
14. According to the text, which changes during pregnancy may not be real? (A) blood volumes. (B) hormone levels. (C) attention ability. (D) absorption of nutrients. (E) gray matter volume.
15. Which of the following sentence is *false*? (A) The gray matter volume loss in pregnant women may cause their forgetfulness. (B). The gray matter volume loss in pregnant women may represent a beneficial process of maturation or specialization. (C) A computer algorithm detecting gray matter loss can 100% predict whether a woman had been pregnant from her MRI scan. (D) The gray matter volume loss in pregnant women can last for at least 2 years. (E) None of above.

Q16-20 are based on an article in PNAS May 17, 2016

Are fMRI studies valid? That is a question that has been posited across the news media last year in the wake of a study by Anders Eklund and colleagues. Several news articles claimed that the study "could invalidate 15 years of research".

In their PNAS paper, Eklund and colleagues studied how reliably different correction procedures widely used in fMRI research control for multiple testing. This was an important investigation at the core of fMRI analyses: fMRI data are essentially blurry 3-D images of the brain. Each image contains many thousand image elements called voxels. Different types of fMRI data analysis exist, but in the predominant approach, a statistical test is conducted for every voxel. This means that we do multiple tests and can easily end up with 100,000 tests or more. It thus requires a reliable method to correct for multiple testing to avoid that the false positive rate inflates massively beyond the 5%.

While demonstrating flaws in certain statistical approaches in fMRI data analysis that lead to high rates of false positives, the study does not invalidate all, or even the majority of, fMRI work. Of the more than 40,000 fMRI studies that have been published to date, certainly not all will be affected. In fact, PNAS has recently released an erratum in which the authors clarify that the results of their study do not affect all published fMRI work. Some reports claimed a software bug caused the high false positive rates. While there was indeed a bug found in one particular software package, it only comprises a relatively small proportion of increased false positives (~15%) in an even smaller proportion of studies.

Anyway, their study has stimulated new discussions and new developments, and made researchers in the field more aware of the assumptions made when conducting analyses on fMRI data.

16. According to the text, current fMRI analyses are (A) completely wrong; (B) completely correct; (C) half correct, half wrong; (D) only few studies are wrong; (E) only few studies are correct.
17. Eklund and colleagues argued that the most important problem of fMRI analysis is: (A) spatial blurring are too big or too small; (B) method to correct for multiple comparison are too difficult to find significant result; (C) false positive rate inflates massively beyond 5%; (D) a bug found in one particular software package; (E) many software packages contains the exact same bug.
18. The reason to perform correction for multiple comparisons is that most fMRI data analyses deal with roughly about _____ voxels in the brain. (A) 100; (B) 1000; (C) 10000; (D) 100000; (E) 1000000.
19. According to the text, about how many fMRI studies have been published to date? (A) 4000; (B) 10000; (C) 25000; (D) 40000; (E) 400000
20. The conclusion of the text is that (A) the most fMRI studies are not validate in the past 15 years; (B) all fMRI studies are reliable; (C) Eklund and colleagues made certain impact on fMRI data analyses; (D) the study of Eklund and colleagues is useless; (E) it is hard to determine the contribution of Eklund & colleagues.

Q21-25 are based on an article in Scientific Reports, Nov 14, 2016

Scientists have recently documented an interesting effect of deep breathing on cognitive functions. A 30-minute session of deep, alternate-nostril meditative breathing exercises can remarkably enhance the retention of newly learned fine movement skills

They challenged two groups of young college students to accurately trace a narrow path within two concentric circles on a tablet in about two seconds. Students in one group were asked to practice the breathing exercises for 30 minutes after learning to trace the path, while students in the other group were asked to simply relax after their learning. The students thus had to learn to be fast and accurate at the same time.

The scientists found that members of the group that practiced breathing exercises after learning were strikingly better in drawing the circles than the students who had just relaxed - measured through how well they recalled the skill, not just immediately but also 24 hours later. In a second experiment, in which the participants practiced breathing after their first retention test, the scientists observed significantly better retention 24 hours after the exercises.

Several earlier studies have suggested that relaxed, deep and slow breathing can improve working memory and mental rotation ability, increase pain tolerance and reduce stress, but the new research is the first to demonstrate the effect of simple breathing exercises on the capacity to remember newly learned movement skills. The study adds fresh evidence on the benefits of deep breathing exercises, typically practiced in meditation program.

21. In this study, what kind of cognitive function is significantly improved after simple breathing exercise? (A) visual working memory; (B) pain tolerance; (C) retention of newly learned motor skill; (D) spatial learning; (E) classical conditioning.
22. It showed that the cognitive improvement (A) is only temporarily; (B) can be found within an hour; (C) can last for at least a day; (D) can last for 24 days; (E) is permanent and can last for very long time.
23. About the task for students to learn, they need to (A) be as fast as possible; (B) be as accurate as possible; (C) be fast and accurate at the same time; (D) do breath exercise during the task; (E) practice the breath exercise before their learning.
24. According to the text, previous studies have shown that relaxed, deep and slow breathing have a variety of benefits, ***EXCEPT***: (A) improving mental rotation ability; (B) increase pain tolerance; (C) reduce stress; (D) improving working memory; (E) facilitate verbal fluency.
25. While the experimental group performed breathing exercises, what did the control group do? (A) practiced motor skill; (B) just relaxed; (C) solved some math problem; (D) tried to sleep; (E) count down from 100 to 0.

Q26-30 are based on an article in Social Cognitive and Affective Neuroscience on, May 11, 2016

A strong focus on reward combined with a lack of self-control appears to be linked to the tendency to commit an offence. A recent fMRI study showed that this combination occurs in psychopathic criminals. Many criminal offenders display psychopathic traits, such as antisocial and impulsive behavior. And yet some individuals with psychopathic traits do not commit offences for which they are convicted. Scientist wanted to find out whether the way a psychopath's brain works is different from that of a non-psychopath. And whether there are differences between the brains of criminal and non-criminal psychopaths.

They carried out tests on 14 convicted psychopathic individuals, and 20 non-criminal individuals, half of whom had a high score on the impulsive/antisocial scale. The participants performed tests while their brain activity was measured in an MRI scanner. The results showed that the reward center in the brains of people with high impulsive/anti-social scores (both criminal and non-criminal) was more strongly activated than those in people with low impulsive/anti-social scores.

Another interesting difference was discovered between non-criminal people with high impulsive/anti-social traits and psychopathic criminals. The data suggest that overt criminality is characterized, not by abnormal reward expectation per se, but rather by abnormal communication between reward center and frontal brain regions. The functional connectivity, which is defined by the correlation coefficient between two regions, was below zero in all healthy high impulsive/antisocial individuals, but above zero in all psychopathic criminals.

Psychopathic criminals have been shown to exhibit abnormal functional and structural connectivity patterns in particular with the dorsomedial prefrontal cortex (DMPFC). This region of the prefrontal cortex has long been implicated in the cognitive control of behavior, especially in signaling the need for performance adjustment and impulsive control. Scientists hypothesize that psychopathic criminals might exhibit a failure of impulsive control due to abnormal connectivity between the reward center and DMPFC.

Although the findings were significant, there is a controversy regarding the application of results. Finding a difference in the brain anatomy suggests that perhaps criminality is out of an individual's conscious control. This may lead to including brain scans as evidence in the courtroom in the future. However, the debate progresses but it is still far from resolved.

26. According to the text, non-criminal people with high impulsive/anti-social traits showed _____ activation in brain reward center. (A) no; (B) weak; (C) normal; (D) strong; (E) unpredictable.
27. The most important difference between non-criminal people with high impulsive/anti-social traits and psychopathic criminals is that (A) activity in the brain reward center; (B) activity in the frontal brain regions; (C) activity in the cerebellum; (D) communication between the reward center and

frontal brain regions; (E) communication between the reward center and cerebellum.

28. Psychopathic criminals show _____ functional connectivity between these regions. (A) zero; (B) positive; (C) negative; (D) unpredictable; (E) unstable.
29. Scientists hypothesize that psychopathic criminals might exhibit a failure of impulsive control due to (A) lack of reward expectancy in the brain; (B) lack of impulsive activity in the brain; (C) abnormal connectivity between these regions; (D) strong impulsive control in the brain; (E) strong reward expectancy in the brain.
30. According to the text, which of the following statement is ***TRUE***? (A) brain scans can be treated as evidence in the courtroom nowadays; (B) the functional connectivity of psychopathic criminals is abnormal; (C) psychopathic criminals cannot control his/her behavior; (D) normal people with high impulsive scores also show abnormal functional connectivity; (E) people with high impulsive scores will become criminal eventually.

B. Translation: Please read the following eight passages and translate them into Chinese. (8 passages, 5 points each, total 40 points for Part B)

Passage #1 is adopted from a review article in Neuropsychopharmacology on Feb. 3, 2016.

Although the concept of valence is intuitive from a behavioral or psychological standpoint, bringing the concept of valence to neurophysiology is more challenging. The crux of the challenge arises from the psychological concept of valence occupying a single dimension, ranging from negative to positive. However, neural responses to cues of positive and negative valences can be independent of each other, and therefore occupy a two-dimensional space. Therefore, there is more than one plausible criterion by which a neuron can represent valence through modulation of its firing rate.

Passage #2 is adopted from a review article in BMC Biology on May 19, 2016.

One of the most enlightening conceptualizations of the neural representation of stored memory information was developed by Richard Semon, who conceived the Engram Theory, a theory of memory traces. According to this theory, as fortified by contemporary knowledge, learning activates a small ensemble of brain cells, inducing in these cells persistent physical/chemical changes. In addition, reactivation of these cells by relevant recall cues results in retrieval of the specific memory. The theory poses an important question: what is the nature of the persistent changes?

Passage #3 is adopted from a 'working life' article in Science on Dec. 23, 2016.

So, little by little, I am now consciously trying to balance my work and personal time. I'm forcing myself to limit my job to five working days, only working during late night and weekend hours if it is strictly necessary, and I no longer feel guilty for taking time off. Thankfully, my adviser and my colleagues respect this choice. I'm learning to better organize my working hours by allocating time slots to specific tasks. I'm also starting to deal with deadlines more realistically, and I'm getting better at balancing my "no"s between my professional and social lives.

Passage #4 is adopted from a 'News & Comment" article in Nature on Dec. 16, 2016.

In January, a computer program beat a world-class human player at the ancient game of Go for the first time. But the ultimate showdown was in March, when the artificial intelligence (AI), called AlphaGo, trounced Lee Sedol — one of the world's top players. The AI, developed by the Google-owned company DeepMind in London, opened with three consecutive wins in the five-round tournament. Lee took the fourth game and nearly won game five, but AlphaGo triumphed.

Passage # 5 is adopted from "Opinion" in Nature Review Neuroscience on Jun 3, 2016

The hippocampus and the orbitofrontal cortex (OFC) both have important roles in cognitive processes such as learning, memory and decision making. Nevertheless, research on these structures has proceeded largely independently, and little consideration has been given to the importance of interactions between them. Recently, evidence is reviewed that they encode parallel, but interactive, cognitive 'maps' that capture complex relationships between cues, actions, outcomes and other features of the environment.

Passage # 6 is adopted from "News & Views" in Nature Neuroscience on Dec 29, 2015

The possibility of using neuroimaging data to predict an individual's behavior is of great interest because it may eventually lead to understanding how processing in the brain gives rise to cognition. Investigating the relationship between connectivity and cognition, and how this varies across subjects, is a primary goal of major recent neuroimaging endeavors such as the Human Connectome Project.

Passage # 7 is adopted from an article in Social Cognitive and Affective Neuroscience on March 24, 2016.

The ability to regulate emotions allows for adapting one's thoughts and feeling. Cognitive reappraisal, reinterpreting the meaning of the emotional stimulus, is one of the most effective strategies for emotion regulation. Recently evidence showed that individual differences in self-control predict successful emotion regulation. High self-controllers successfully maintained down-regulation of emotional neural circuitry, while low self-controllers failed.

Passage # 8 is adopted from an article in PNAS on Oct 11, 2016.

Oscillatory neural dynamics play an important role in the coordination of large-scale brain networks. High-level cognitive processes depend on dynamics evolving over hundreds of milliseconds, so measuring neural activity in this frequency range is important for cognitive neuroscience. By significantly increasing the speed of functional MRI, researchers have been able to image rapidly fluctuating brain activity during human thought.