

筑波大学 理工学群 社会工学類
平成29年度私費外国人留学生入試
小論文問題

【注意事項】

1. 試験開始の合図があるまで、この問題の中身を見てはいけません。
2. すべての解答用紙と下書き用紙の定められた欄に、志望する「学群・学類」、
「氏名」、「受験番号」をすべて記入すること。
3. 問題冊子は表紙を含め5ページあります。
4. 解答は、下記の通り、必ず3枚の解答用紙(マス目用紙)を使用すること。
設問1～3・・・解答用紙1枚目
設問4～6・・・解答用紙2枚目
設問7・・・解答用紙3枚目
5. 解答に際しては、設問番号を明記してから解答を作成すること。
6. 試験終了後、解答用紙と下書き用紙を別々に集めます。問題冊子は持ち帰ってください。

次のページ以降の英文は、2016 年 11 月 19 日付 The Japan Times に掲載された脳と記憶に関する記事です。この英文を読んで、次の 7 つの設問に日本語で答えなさい。

設問 1

本文中に記述されている 2 種類の記憶の特徴を 100 字程度で述べなさい。

設問 2

下線(1)を日本語に訳しなさい。

設問 3

下線(2)の根拠となる内容を 100 字程度で述べなさい。

設問 4

下線(3)を日本語に訳しなさい。

設問 5

下線(4)を日本語に訳しなさい。

設問 6

下線(5)の根拠となる内容を 150 字程度で述べなさい。

設問 7

脳への外部刺激によって記憶に関して何かしらの効果が得られるようになった場合、こういった利用法が考えられるか。この記事の内容を参考にして、あなたの意見をその根拠とともに 300 字程度で述べなさい。

Reorganizing the Brain in Stroke Recovery

For some athletes, recovery has come from a dedication to practice and the repetition of a particular routine. Baseball icon Yogi Berra's or English soccer star David Beckham are two examples that immediately spring to mind.

Berra, for example, made hitting around 100 grand slams per day as a child practicing with his father. These days, his daily routine includes weight training to maintain strength and flexibility. Beckham, meanwhile, says he now lives practicing taking care of thousands of the balls as a child.

Yogi Berra and David Beckham popularized the idea that repetition can produce a reshaping of the practice – particularly with the 10,000-hour myth. Berra, however, says that such practice needs to be concentrated on a particular task in order to improve. What's more, the 10,000-hour is the average amount of time that people spend performing a technique.

University of Tokyo neuroscientist Shinya Yamanaka has been attempting to discover how the brain forms new skills. His research shows that "motor memories" – also called "muscle memories" – are associated with specific skills and formed according to the size of the brain at the time of learning. Yamanaka can also show that such muscle memories can be manipulated.

"I guess the reason why a lot of athletes try to perform a routine is to get the brain into a particular state," Yamanaka says. The brain itself could perform as a method of training motor skills by manipulating the brain state and, therefore, improving performance.

Motor memories are almost impossible for the human body to forget. Making a muscle is the most obvious example of this in sports – but even your "ice cream brain" is still a little, you know, frozen.

The other kind of memory – skills such as people's names, historical events or even the facts in this story – are called "cognitive memories." They can be continuously improved on, but are ultimately forgettable.

It's hard to imagine now that we didn't know there was a difference in the brain between those who think of memory. The breakthrough was made in 1967 when a Canadian psychologist from McGill University in Montreal published one of the 20th century's most important papers on the human brain.

Donald Milner had been working with a man called Henry Milner. Henry is the scientific literature as "patient H.M." Milner suffered from severe epilepsy and, as a last resort, a major removal part of the temporal lobe of Milner's brain in 1953. The epilepsy disappeared, but so did Henry's ability to form new memories. Each day he would "lose the memory from a blank – every day is like a blank."

Milner had Milner show a few famous men pictures of a man while working the

learned the page is a letter?" She said that in this second phase over different days that when he couldn't learn any more information, he had an anxiety of being asked to do this task.

Winters wasn't consciously aware of having performed the drawing task for Wilkes, but his ability to complete the task improved each time. His brain was learning and he was acquiring some kind of motor memory. Wilkes concluded that "Chenault's memory could be formed independently from a person's explicit memory. Winters had lost the ability to store specific details, but the part of his brain where motor memory was kept remained intact."

Chenault hypothesized that if the state of the brain varies according to the specific motor skills being learned, then different motor memories would be created.

To test this, he used a technique called DRT to construct three unique environments, in which electrodes are placed on the scalp and a small current is passed through the brain that triggers motor movement. I've experienced this myself and it's an odd sensation. It doesn't hurt, but it's strange to feel your brain do something you didn't authorize.

The DRT was used to create two different brain states. Wilkeson is Chenault's lab performed a movement-based task while a different stimulation was applied to the brain. It was a simple task. "Chenault had to push a lever forward while simultaneously applying a task, an eight-note chord to the handle. Once they had learned the task, the volunteers performed it again without stimulation, but in created the same brain state using DRT."

The new subjects viewed the lever as a direction to remember the force they experienced during their training, even if no actual force was being applied. This indicates that they were automatically recalling the motor memory linked to that brain state.

Chenault's work shows that motor memories are "tagged" to specific episodes.

Performing a motor-learning task under different brain states could make motor memory storage to vary.

"The technique cannot be used to create motor memory itself," he says. "However, it may be used to make the memory more reliable or robust."

Chenault's team is now examining the question, among other things, whether applying DRT to well-learned during sleep enhances motor memories.

Remember, while asleep? That's great news for those of us who don't have the dedication to practice an office or athletic talent in the daytime.

出典

Rowan Hooper, Manipulating the brain to hasten learning, November 19, 2016 <
<http://www.japantimes.co.jp/news/2016/11/19/national/science-health/manipulating-brain-hasten-learning/#.WGx0M6KLRBw> >

注

- manipulate: 制御する
- hasten: 加速する
- popularize: 世に広める
- neuroscientist: 神経科学者
- motor: 運動、運動の
- ultimately: 最終的に
- epilepsy: てんかん（脳に起きる異常な神経活動のための反復性の発作）
- last-resort: 最終手段
- temporal lobe: 側頭葉（脳の側面部）
- intact: 損傷を受けていない
- electrode: 電極
- scalp: 頭皮
- sensation: 感覚
- authorize: 許可する
- counteract: 対抗する

Larry R. Squire, Neuron 2009; 61(1): 6–9 より抜粋。

Daichi Nozaki et al., eLife 2016; 5: e15378< <https://elifesciences.org/content/5/e15378-download.pdf>>より抜粋。一部改編。