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次の [英文 A] 及び [英文 B] は、“uncanny valley effect (不気味の谷効果)” に関する研究の変遷について述べています。英文を読み、問題に答えなさい。

[英文 A]

At about 20cm tall, RoboHon is a walking, talking voice-controlled robot that can play games, dance, project visuals onto a wall—it even has a facial recognition function that allows it to get a feel for the mood you are in. With a physical appearance that is loosely modeled after humans, this Japanese-made robot stands upright with two legs, two arms, wide-open eyes, and a friendly facial expression. Its childlike voice and jolly character instantly make you want to give it a big hug and be best friends forever. As more robots like RoboHon come into our everyday lives—as teachers, co-workers, aides for the sick and elderly, and even as companions—it is crucially important that they make humans feel comfortable interacting with them.

Hundreds of studies exploring ways to promote 1)smooth human-robot interaction have been carried out in recent years. In general, scientists and robotics engineers agree that machines with a lifeless appearance are much less attractive than ones with a recognizable likeness, which implies familiar behavior. As robots begin to appear more humanlike, people tend to respond to them more positively. These humanoid robots engage us better, since they can communicate in natural and familiar ways through social cues—like facial expressions, body postures, eye gaze shifts, and gestures.

However, a popular idea known as “the uncanny valley” suggests that there’s a problem in designing robots with 2)that approach. The uncanny valley is a characteristic decline in emotional response that happens when we encounter an object that is almost, but not quite, human. It was first hypothesized in 1970 by Japanese roboticist Masahiro Mori who noticed that as robots became more human-like, people would find them to be more acceptable and appealing than their mechanical counterparts. But this only held true up to a point. When they were close to, but not quite, human, people developed a sense of unease and discomfort. Then, when human-likeness increased beyond this point, and they became very close to human, the emotional response returned to being positive. It is this distinctive decline in the relationship between human-likeness and emotional response that is called the uncanny valley.

Anything with a highly human-like appearance can be subject to the uncanny valley effect, but not all near-human robots are weird, and the perception of weirdness varies from



person to person. So what evidence exists for the effect and what properties of near-humans might make us feel so uncomfortable?

Scientific investigation into the uncanny valley didn't really start until about the early 2000s, which is roughly when researchers developed the ability to design highly realistic humanoid robots. One of the earliest studies proposed that negative reactions to humanlike robots are more related to good or bad (あ), and can occur at any level of realism. In other words, both highly realistic and unrealistic humanoid robots can cause unpleasant feelings with certain physical features—like bad skin, sickly eyes, significant asymmetry, and an untidy appearance. On the other hand, clear skin, symmetry, and a neat appearance accompanied by oversize eyes, smaller-than-usual noses, or very large smiles can still be seen as highly (A) despite being (B), if the proper balance is achieved. The study did find an uncanny valley effect when participants looked at a series of images from unrealistic to very realistic humanoid robots, but that effect disappeared when the same images were made more attractive. 3) The researchers concluded that although the uncanny valley may exist, the phenomenon could be overcome with careful design. A number of subsequent studies have both supported and conflicted with these results, and researchers have even debated whether the uncanny valley exists at all.

[1] 下線部 1) の反対の意味を表す語を選択肢から選び、記号で答えなさい。

- (a) rough (b) uneven (c) stubborn (d) awkward (e) embarrassing

[2] 下線部 2) はどのようなものか、説明しなさい。

[3] 森政弘博士の“the uncanny valley effect”に関する仮説はどのようなものか、150字以内で説明しなさい。

[4] 空欄 (あ) に入る最も適切な語を選択肢から選び、記号で答えなさい。

- (a) design (b) pattern (c) research (d) skill (e) system

[5] 空欄 (A) 及び (B) に入る語の組み合わせを選択肢から選び、記号で答えなさい。

- (a) (A) appealing (B) truthful (b) (A) attractive (B) unrealistic
(c) (A) repulsive (B) idealistic (d) (A) uncomfortable (B) representable

[6] 下線部 3) は、この研究のどのような結果から導かれたか、説明しなさい。



[英文 B]

Despite the history of inconsistent research, a recent study provides compelling evidence to support the uncanny valley claim. What makes it different than earlier work is that 1) a research team of biostatisticians at the University of California may have avoided some problems that could have obscured results in prior studies.

In order to test whether the uncanny valley effect occurs with real-life robots, as the first step, the researchers used 80 pictures of robots that have actually been built, rather than using computer-generated blends of human and robot faces, which often have unnatural distortions that cause strange features. These robot faces ranged from the cartoonish and metallic to the thoroughly realistic. They asked 66 workers from online marketplaces to rate the faces on a scale from 1 to 100, based on how mechanical and how human they looked. They, then, asked the workers to consider an important question: how enjoyable would it be to interact with that face every day?

The researchers found that the robots' perceived friendliness closely matched the predicted uncanny valley curve. As the faces gradually shifted from totally mechanical to more lifelike, their likeability scores went up, then fell, then climbed back up again.

For the next step, participants were asked to play an economic investment game with the robots to determine how much they trusted them. This is important because social trustworthiness is a big part of our willingness to interact with one another. The subjects were given up to \$100 and were told to decide how much money to give to each robot in the hopes that they would receive a return on that investment.

The results again showed a strong uncanny valley effect. The amount of money wagered by participants first increased before drastically dropping, only to increase again when robots began to look identical to humans.

〔1〕 下線部 1) が行った第一段階の研究に関して、空欄 (ア) ~ (エ) を埋めなさい。

被験者	オンラインマーケットプレイスで働く 66 人
実験目的	(ア)
実験に使用したもの	(イ)
実験手順 1	(ウ)
実験手順 2	(エ)
結果	研究者チームの予測通り



[2] 下線部1) が行った第二段階の研究に関して、内容に合っているものを選択肢から1つ選び、記号で答えなさい。

- (a) Participants were asked to give money to the robots that seemed friendliest.
- (b) The same uncanny valley effect was found when participants rated the robots' trustworthiness as when they rated the robots' friendliness.
- (c) How trustworthy someone seems is the most important factor in determining whom we will interact with.
- (d) This study showed the connection between social cues and communication in terms of the uncanny valley effect.
- (e) Participants were told how much money to put on each robot.

2

以下は、受験生と面接官の間の面接内容です。空欄(1)～(8)に入る最も適切なものを選択肢から選び、記号で答えなさい。
(選択肢はそれぞれ、1回のみ使用できる。)

Interviewer: Okay. You're Sakura Miyake, right?

Sakura: Right.

Interviewer: Okay. Let's begin, shall we? (1)

Sakura: I'm Sakura Miyake. I'm 19 years old. I graduated from high school last year, and have been studying at home and *Yobi-ko* for medical school entrance examinations. I'm originally from Hokkaido, but I live in Tokyo now. Since my grandfather is a surgeon, I have been dreaming of becoming a doctor, hopefully a surgeon, too. My future goal is to practice medicine in poor areas overseas.

Interviewer: Good. Okay. Now, I'm going to ask you one specific question. You have to answer it clearly and concisely. After that, I'm going to ask some questions about your answer. You have to explain your answer with reasons. (2)

Sakura: I think so.

Interviewer: Some people think that those living 50 years ago were more fortunate than we are now. (3)

Sakura: My answer is definitely no. I don't think that people living 50 years ago felt more fortunate than we do. The reason I feel fortunate now is ... because we have computers and the Internet. We can communicate with friends online very easily whenever we want to. Also, we have smartphones now. My mother told me how inconvenient those days were when there were no cellphones or smartphones available. We don't have to meet our friends to talk—it's amazing!! (4) My high school English teacher used to say that we are so lucky to have electronic dictionaries. We don't have to carry heavy paper dictionaries like my teacher did. Then ... ah, we also have air conditioners, so we can study comfortably even during the extremely hot season.



Interviewer: Thank you, Sakura. (5) Your opinion is focused on technology. Okay, then, why do you think it is amazing to talk with people without actually meeting them? Some people may prefer face-to-face communication more. (6)

Sakura: Well, personally, I think so. I like to talk with my friends face-to-face. My point is that compared to the situation 50 years ago, we have more options and it's wonderful. I think face-to-face communication is important. It's nice for people to be able to do both, though.

Interviewer: I understand. Do you have any other ideas about what we have now that people in the old days didn't have?

Sakura: (7) There are more social and economic options in the modern world than 50 years ago. For example, these days, more and more women can work. I have read somewhere that our government promotes employment of disabled people, and this gives them opportunities to be independent in society. I think the social status of those people—women, poor people, disabled people, and others—is equal to everyone else now. Until recently, I think those people were treated unfairly and disregarded.

Interviewer: Okay, but I think there are still many situations where those people strongly feel inequality and are overwhelmed in today's society. (8)

Sakura: Compared to society 50 years ago, more and more people help and support those people. I believe that people today can accept differences in individuals. So, in the near future, everyone's situation will improve and we will all live together peacefully in our society.

Interviewer: Okay, our time is up. Thank you.

Sakura: Thank you very much.

選択肢

- あ. And there are many more reasons.
- い. Certainly, there are many human rights organizations in the world.
- う. Don't you think so?
- え. Do you agree with this statement?
- お. Do you have anything to say about that?
- か. Do you mean that?
- き. Have you got that?
- く. It's our development of communication.
- け. I understand your point.
- こ. I want to tell you about my high school principal.
- さ. Let's start with little bit about yourself.
- し. Tell me things about your high school.
- す. Yes, we have equality of opportunity now.



3

次の〔1〕～〔5〕には誤りが1箇所ある。誤りの箇所を記号で答えなさい。

- 〔1〕 (a)As opposed to (b)expectations, the teacher was (c)pleasing with our performance (d)at the competition.
- 〔2〕 Our motto (a)comes from a famous quote of Albert Einstein: “Everything should be kept as (b)simply as possible, but not (c)simpler.” However, we also believe it is important to avoid (d)oversimplification.
- 〔3〕 If I (a)shall die unpredictably, please (b)donate my organs for research or to (c)someone who is in need (d)of a transplant.
- 〔4〕 (a)Currently, waiting time is more than 30 minutes. Please enter (b)to the consultation room (c)when your reception number on the electric bulletin board is enlarged and (d)blinks.
- 〔5〕 (a)With help from my friend, I am sure they (b)will have no difficulty (c)to finish the project (d)by the deadline.

4

次の〔1〕～〔5〕の空欄に入る最も適当なものを選択肢から選び、記号で答えなさい。

- 〔1〕 An ear infection () bacteria enters the space behind the eardrum.
(a) seems that (b) occurs when (c) happens as (d) is if
- 〔2〕 The pain medication will () after eight hours. You can take it up to three times a day, but no more.
(a) wear off (b) turn down (c) leave out (d) die over
- 〔3〕 Stay away from me—I think I’m () a cold.
(a) getting close to (b) falling into
(c) breaking out with (d) coming down with
- 〔4〕 As I (), a delivery person rang the doorbell with a package for me.
(a) to feed my cat (b) am feeding my cat
(c) had fed my cat (d) was feeding my cat
- 〔5〕 All of the copy machines in our office are out of order and ().
(a) need to be repairing (b) repairing is required of them
(c) need to be repaired (d) require that they are repaired

