Mental fatigue has psychological triggers: Research suggests challenging goals can head it off

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Do you ever feel spacey, distracted and worn down toward the end of a long work-related task—especially if that task is entirely a mental one?

For over a century, psychologists have been trying to determine whether mental fatigue is fundamentally similar to physical fatigue or whether it is governed by different processes.

Some researchers have argued that exerting mental effort depletes a limited supply of energy—the same way physical exertion fatigues muscles. The brain consumes energy in the form of glucose, which can run low.

Other researchers see mental fatigue as more of a psychological phenomenon. Mind-wandering means the current mental effort is not being sufficiently rewarded—or opportunities to do other, more enjoyable activities are being lost.

My colleagues and I have been trying to resolve this question. Our research suggests mental fatigue is in large part a psychological phenomenon—but one that can be modified by setting goals.

Vigilance is hard to sustain

We began by reviewing the science related to mental fatigue.

Psychologists in the World War II era studied why soldiers monitoring radar were losing focus during their shifts. Psychologist Norman Mackworth designed the "clock test," in which military participants were asked to watch a large "clock" on a wall for up to two hours. The second hand ticked at regular intervals. But rarely and unpredictably, it would jump twice the usual distance. The task was to detect those tiny variations.

Within the first 30 minutes, the subjects' performance dropped dramatically—and then continued to decline more gradually. Psychologists named the necessary mental focus "vigilance"—and

concluded it was fundamentally limited in humans.

Decades of research since has confirmed that vigilance is difficult to maintain, even over brief intervals. In studies, people report feeling stressed and fatigued following even a brief vigilance task. In 2021, one study even showed a reduction of blood flow through the brain during vigilance.

My colleagues and I wondered: Are all forms of mental work like vigilance? Surely, there are instances where people can engage with mental work without feeling fatigued.

Setting goals

We decided to study whether goal-setting could improve mental focus and ran three experiments to test this idea.

In the first experiment, we showed 108 undergraduate students at the University of Oregon a screen with four empty white boxes against a gray background. Every one to three seconds, an X appeared in one of the four boxes. Their task was to indicate where that symbol appeared as quickly as possible. After each response, the participant was given feedback about both their accuracy and their speed, such as "Correct! Reaction time = 400 milliseconds."

Periodically during the 26-minute test, we also asked participants to rank their mental state as task-focused, distracted or mind-wandering. This gave us data about how they felt, in addition to how they did.

We randomly gave half of them a specific goal: Keep their reaction times under 400 milliseconds while staying as accurate as possible. We gave no goal to the other half.

Our results were mixed. People who were given a goal did not experience as many slow reaction times, but having goals didn't increase their top speed. It also didn't change how often people reported feeling distracted.

Setting increasingly harder goals

We decided to tweak the test for our second experiment. Again, we randomly assigned a goal to half of the 112 fresh participants and no goal to the other half. But this time, as the experiment progressed, we increased the difficulty of the goal from a 450-millisecond reaction time to 400 milliseconds and then to 350 by the final block. Setting these harder-over-time goals had a huge effect on performance.

Compared with the participants assigned a set goal in the first experiment, the participants assigned increasingly more difficult goals in the second experiment had faster reaction times by an average of 45 milliseconds—about a 10% improvement. Participants in the second experiment also reported fewer instances of mind-wandering and showed no slowing of reaction times throughout the experiment. In other words, they showed no signs of mental fatigue. And we didn't have to make the task easier. In fact, we made it harder.

Our first two experiments were conducted online because of shutdowns related to COVID-19. Our third study—a repeat of our second study—was conducted in person. We got the same results.

These findings, combined with other recent work we've conducted, have changed the way my colleagues and I consider mental fatigue. It's clear that when people strive for specific and hard-to-reach goals, they report feeling more motivated and they do not report feeling as drained by mental work.

If you're wondering how to implement these findings in your life, make simple, direct and specific goals for yourself. Mark when you complete the goals—the feedback can help you keep going. If you're feeling particularly drained, take short breaks. Even brief rests of less than two minutes can restore capacity for mental work.

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