# Avoid impulsive acts by imagining future benefits: Waiting more pleasurable if focus is on good things ahead

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Study participants were observed while waiting for rewards of juice for completing experimental tasks. Credit: Wustle photo

(Medical Xpress)—Why is it so hard for some people to resist the least little temptation, while others seem to possess incredible patience, passing up immediate gratification for a greater long-term good?

The answer, suggests a new brain imaging study from Washington University in St. Louis, lies in how effective people are at feeling good right now about all the future benefits that may come from passing up a

smaller immediate reward. Researchers found that activity in two regions of the brain distinguished impulsive and patient people.

"Activity in one part of the brain, the anterior prefrontal cortex , seems to show whether you're getting pleasure from thinking about the future reward you are about to receive," explains study co-author Todd Braver, PhD, professor of psychology in Arts & Sciences. "People can relate to this idea that when you know something good is coming, just that waiting can feel pleasurable."

The study, which was published in the first issue of the *Journal of Neuroscience* this year, was designed to examine what happens in the brain as people wait for a reward, especially whether people characterized as "impulsive" would show different brain responses than those considered "patient."

The lead author of the study was Koji Jimura, then a postdoctoral researcher in Braver's Cognitive Control and Psychopathology Laboratory, and now a research associate professor at the Tokyo Institute of Technology, in Japan.

Unlike previous research on delayed gratification that had people choose between hypothetical rewards of money over long delays (e.g, $500 now or $1,000 a year from now), this Washington University study presented their participants with real rewards of squirts of juice that they chose to receive either immediately or after a delay of up to a minute.

"It's kind of funny because we treated the people in our study like researchers that work with animals do, and we actually squirted juice into their mouths," Braver says.

Results show that a brain region called the ventral striatum (VS) ramped up its activity in impulsive people as they got closer and closer to

receiving their delayed reward. The VS activity of patient people, on the other hand, stayed more constant.

The researchers interpreted these different brain responses to mean that impulsive people initially did not find the prospect of waiting for a reward very appealing. However, as they approached the time they'd receive that reward, they became more excited and their VS reflected that excitement.

"This gradual increase may reflect impatience or excessive anticipation of the upcoming reward in impulsive individuals," says Jimura. This was unlike patient people, who were likely content with waiting for the reward from the start, as no changes in VS activity were observed for them.

The most novel finding of the study concerned the anterior prefrontal cortex (aPFC). This is the part of the brain that helps you think about the future. Here, we found that the patient people heightened activity in the aPFC when they first started waiting for they reward, which then decreased as the time to receive the reward approached. Impulsive people didn't show this brain activity pattern.

"The aPFC appears to allow you to create a mental simulation of the future. It helps you consider what it'll be like getting the future reward. In this way, you can get access to the utility and satisfaction in the present," says Braver.

By thinking about the future reward, patient people were able to gain what economists call "anticipatory utility." While their reward was far away in time, they were giddy with anticipation in the present. Conversely, impulsive people weren't thinking beyond the present and so did not feel pleasure when they were told they had to wait. Their excitement built only as they got closer to receiving their reward.

Overall this study suggests that people may be impulsive because they do not or cannot imagine the future, so they prefer rewards right away. This research could be useful for assessing the effects of clinical treatments for impulsivity problems, which can lead to issues such as problem gambling and substance abuse disorders. A similar brain imaging approach as was used in the Washington University study could allow clinicians to track the effects of an intervention on changes not only in impulsive behavior but also changes in patients' brain responses.

"One possible treatment approach could be to enhance mental functions in aPFC, a brain region well-known to be associated with cognitive control," says Jimura. By increasing cognitive control, impulsive patients could learn to reject their immediate impulses.

Impulsivity occurs not only in a clinical setting but also every day in our own lives. Applying his research to his personal life, Braver says, "When I'm successful at achieving long-term goals it's from explicitly trying to activate that goal and imagining each decision as helping me achieve it, to keep me on track." Perhaps adopting this strategy of focusing on the long-term could help us move past present distractions and move toward our future goals.

Provided by Washington University in St. Louis