

Study Reveals Brain Biology Behind Self-Control

By Sarah D. Sparks

A new neuroscience twist on a classic psychology study offers some clues to what makes one student able to buckle down for hours of homework before a test while his classmates party.

The study, published in this month's edition of *Proceedings of the National Academy of Science*, suggests environmental cues may "hijack" the brain's mechanisms of self-control in some people and some circumstances.

The findings add to a growing body of research suggesting that a student's ability to delay gratification can be as important to academic success as his or her intelligence—and that educators may soon know how to teach it.

More than 40 years ago, Stanford University researchers led by Walter Mischel conducted a now-famous study in self-control: They asked 4-year-olds at Stanford's Bing Nursery School to hold off eating one sweet in exchange for the promise of two sweets 15 minutes later. Fewer than one in three children passed the so-called "marshmallow test."

In the years that followed, numerous follow-up and variation studies have found that the preschoolers who managed to delay gratification were also more likely later on to do well in school, avoid substance abuse, maintain a healthy weight, and even perform better on the SAT than peers who couldn't resist temptation.

The studies by Mr. Mischel, who is now a psychology professor at Columbia University, and a cadre of other researchers have helped change the way scholars and educators think about why students succeed academically. In a separate self-control study, Angela L. Duckworth, an assistant psychology professor at the University of Pennsylvania, even found that self-control was a better predictor of a student's academic performance than an IQ test.

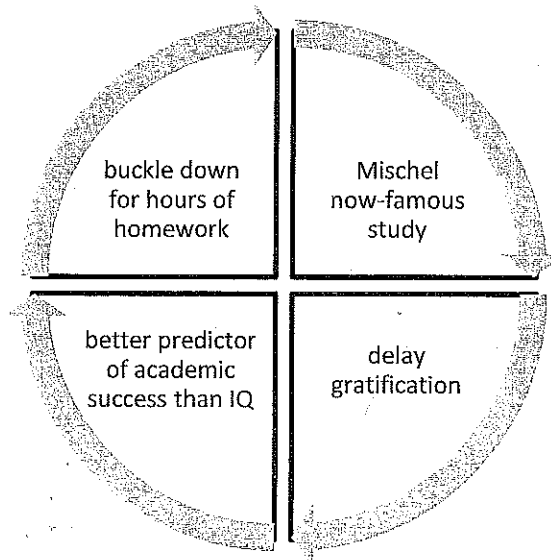
Yet the brain has remained a missing piece of the puzzle, according to B.J. Casey, the director of the Sackler Institute for Developmental Psychobiology at the Weill Cornell Medical College in New York City. The new study is the first to compare brain differences among those original Stanford preschoolers.

"What we wanted to do is try to understand how the brain is related to this behavior," said Ms. Casey, who led the new study. Brain imaging, she said, "is helping us to disentangle the impulse control from sensitivity to rewards and social cues."

Reading Strategy: Concept Circles

Name the concept described in the circle.

Concept: _____



Control in the Brain

Of the 562 Bing Nursery School pupils who took part in the original Stanford study in the late 1960s and early 1970s, 155 participated in a follow-up in 1993 and 135 in another in 2003. Ms. Casey's team focused on 60 who consistently showed a high ability to delay gratification and another 57 with consistently low ability to delay.

Researchers found that the brain seems to bring two different areas to bear when a decision is made. In an objective, unemotional question, the brain triggers the prefrontal cortex, which helps us make rational decisions. Other decisions are more urgent and more dependent on context and here, environmental and social cues can activate a deeper, more primitive part of the brain.

As it turns out, Ms. Casey said, people who have difficulty delaying gratification also tend to be "very, very sensitive to environmental cues." All of the adults in the study were able to respond correctly in neutral situations. Differences arose between the adults who could delay gratification in which they were asked to counter a strong environmental cue.

Environmental Cues

"Sensitivity to environmental cues influences an individual's ability to suppress thoughts and actions- Control systems may be 'hijacked' by a primitive system in the brain. Experts said this finding might help explain the dip in self-control that parents and teachers often report in teenagers.

"Children are more impulsive than adolescents, but right around puberty there's a much greater sensitivity to social cues and environment, and adolescents are more sensitive to social cues than either children or adults."

Reading Strategy: Text Frames With Gaps

Fill in the missing information from the selection above.

- The brain seems to use two different areas when a decision is made.
- The prefrontal cortex helps us make unemotional, rational decisions.
- Other decisions that depend on environmental cues use a more primitive part of the brain.
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- All adults in the study were able to respond correctly in neutral situations.
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- Sensitivity to environmental cues influences an individual's ability to suppress thoughts and actions, such that control systems may be 'hijacked' by a primitive system in the brain.

In the Field

Dr. Mischel and Ms. Duckworth have been studying whether it's possible to teach students how to delay gratification and improve self-control through school-based interventions.

In a 2010 study, Ms. Duckworth found that high school students who visualized both their academic goal for an upcoming high-stakes exam and potential pitfalls in meeting that goal answered 60 percent more questions on a practice exam than peers who had not done the exercise.

Ms. Duckworth is currently working on two separate evaluations of self-control instruction in New York City and Philadelphia.

Last week, Mitch Brenner, the assistant principal at the KIPP Academy Middle School in New York, one explained the original "marshmallow experiment" to a class of 6th graders. He asked them to talk about how they would have decided whether or not to eat the sweet, and how self-control relates to the school's academic requirements.

"We are asking kids to make sacrifices in the course of their careers here," said Mr. Brenner, who is developing the lessons as part of the pilot study. "You are putting in long hours, you are doing homework while you would rather be playing video games or watching TV, and that can have benefits down the road, but it can be tough, particularly for a kid. We want to give them exposure to that idea, motivate them and help get them thinking."

The KIPP school also created a "character-rific" honor board to leverage adolescents' social sensitivity to improve rather than impede their self-control. Students nominate classmates or teachers as having good character based on self-control and other qualities.

"I can tell kids all day what grit looks like, what self-control looks like, but when the kids give the examples, that's where the real power comes from," Mr. Brenner said. "Some kids may struggle more academically, but when they get shouted out as being a good person, that feels great."

Back in Mr. Brenner's class on self-control, students got their own marshmallows and debated the pros and cons of immediate versus delayed gratification. At the end of the class, Mr. Brenner let the students eat their marshmallows—though one boy opted to save his for later.

Reading Strategy: Personal Connections

What are the implications of this research for your classroom?

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