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The Gravity of Weight

Lead Us Not Into Temptation: Science & The Marshmallow Test

What 40-year-old marshmallows can teach us about dieting

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In the 1960s and 1970s, Walter Mischel and his colleagues began a study with 500 nursery school children of faculty and graduate students at Stanford University. These researchers were interested in "demystifying" the concept of "willpower" in their 4-year-old subjects. "What began as a set of experiments with preschoolers turned into a life-span developmental study," said Mischel et al. The investigators devised a "delay-of-gratification paradigm," popularly known over the years as the famous "marshmallow test," and even described in Daniel Goleman's book, *Emotional Intelligence.*

The researchers were interested in how children were able to resist temptations (i.e., delay gratification). There were several variations on the actual experiment, but essentially it involved presenting these preschoolers with particularly desirable treats, such as cookies, pretzels, and marshmallows (hence "the marshmallow test") and apprising them of the advantage (e.g. "a larger, later reward") of resisting their temptation to eat them immediately and delaying until the experimenter returned, usually only about 15 minutes later.

What they found is that those children who could delay their gratification were, in general, ten years later as adolescents, more "socially and academically competent" than their peers, as well as "more able to cope with frustration and resist temptation." Unbelievably, Mischel et al reported, "seconds of delay time in preschool also were significantly related to the SAT scores when they applied to college." The researchers

also suggested that a family environment where "self-imposed delay" is "encouraged and modeled" may give children "a distinct advantage" to deal with frustrations throughout life.

How were some preschoolers able to delay gratification? They used several strategies, such as avoiding looking at the treats in front of them, covering their eyes with their hands, talking to themselves, singing, and even trying to go to sleep during the brief waiting period (i.e., all "directing their attention and thoughts away from the rewards"). Paying attention to the rewards "consistently and substantially" interfered with the children's ability to delay.

Over time, the researchers also found, though, that stimuli can be what they call either "hot" ("consummatory") or "cool" (i.e., abstract or "non-consummatory"). In other words, even though "attention is the crux of self-control," it can have either a "facilitating" or "interfering" effect on resisting temptation, depending on cognitive features such as whether our attention is "arousing or abstract." For example, older children and adults can develop more sophisticated strategies: instead of thinking of the appealing qualities of a marshmallow (e.g. toasted, warm, gooey, and delicious), they can redirect and refocus more on its shape and color ("non-consummatory," cool properties) and imagine the marshmallow as a tasteless ball of cotton.

Most recently B.J. Casey, Ph.D., Sackler Professor and Director of the Sackler Institute for Developmental Psychobiology at Weill Cornell Medical College in New York, and her colleagues have followed up on nearly 60 of the original sample of preschoolers, now in their 40s, to study gratification delay and two brain systems—"hot" (emotions and desires) and "cold" (cognitive control) involved. Their article can be found in the September 2011 issue of the *Proceeding of the National Academy of Science* (USA) What they found is that the ability to resist temptation is fairly stable over the lifecycle and predictive of behaviors 40 years later! Of course, since marshmallows and cookies don't quite have the same tempting quality as they once did when these subjects were nursery age, Dr. Casey and her colleagues devised experiments using social cues of faces with different emotional (e.g. happy, sad, neutral) expressions to study impulse control in their middle-age subjects.

For the first time, though, Casey et al were also able to use functional magnetic resonance imaging (fMRI) to study a subset of 26 of the original preschoolers. They were able to identify and confirm that different areas of their brains become more active in the so-called "high delayers" (prefrontal cortex) and "low delayers" (ventral striatum). They found, as well, that resisting temptations varies not only by cognitive control mechanisms but also by the context and the

Imagine marshmallows as tasteless cotton balls

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salience (i.e., the "compelling nature") of the stimulus. For example, these cognitive mechanisms can be "hijacked" by the more emotional and primitive areas of the brain (e.g. limbic system), especially at certain vulnerable times (e.g. adolescence) or with exposure to certain environmental cues (e.g. drugs, tempting foods). Even the behavior and attitudes of other people, i.e., social influences, can influence the ability to delay gratification.

This of course, has relevance for dieters, and restaurants seem to know this intuitively when they, knowing that many people will be less likely to resist, bring diners a dessert tray with an assortment of delicious offerings. So try to distract yourself by averting your eyes from the tray (a kind of "out- of-sight, out-of-mind" cognitive behavioral technique) or else imagine some neutral or perhaps even some truly disgusting substitute there in front of you.

About the Author

Sylvia R. Karasu, M.D., is a clinical professor of psychiatry at Weill Cornell Medical College and the senior author of *The Gravity of Weight.*

In Print: *The Gravity of Weight: A Clinical Guide to Weight Loss and Maintenance*

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