

# Estrogen-deficient female athletes' memory improves with estrogen

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In young female athletes who stop having their menstrual periods because of excessive exercise, estrogen replacement appears to improve their memory, a new study finds. Researchers will present their study results on Saturday at the Endocrine Society's 98th annual meeting in Boston.

Amenorrhea, or lack of periods, occurs in up to 44 percent of exercising women, according to the American College of Sports Medicine. Estrogen deficiency due to amenorrhea may possibly result in forgetfulness and poor concentration. Some studies have found a positive effect of estrogen replacement on mental processes such as memory in postmenopausal women and young girls with Turner syndrome, a genetic condition that can cause [estrogen deficiency](#).

"This is the first study, we believe, to assess the impact of estrogen replacement on memory and other cognitive processes in young athletes who lose their periods due to excessive exercise," said Charu Baskaran, MD, the study's lead investigator and a pediatric endocrinologist at Massachusetts General Hospital for Children, Boston. "This information is important because these athletes are in their prime of neurocognitive development."

This National Institutes of Health-funded study examined the effect of estrogen replacement on mental processes, including memory, in 29 amenorrheic [female athletes](#) ages 14 to 25 years compared to 19 who received no estrogen replacement. According to Baskaran, the athletes in

the study had stopped menstruating for longer than three months, or never started menses, because of too much aerobic physical activity, averaging more than 10 hours a week.

Study participants were randomly assigned to one of three treatment groups for six months: (1) oral estradiol and progesterone at a dose similar to that in many birth control pills (16 participants); (2) transdermal estradiol, better known as the estrogen patch, at a physiological replacement dose with cyclic progesterone (13 athletes); or (3) no estrogen (19 subjects). Participants who received [estrogen therapy](#) also received progesterone because giving estrogen alone can increase the long-term risk of uterine cancer, Baskaran noted.

Cognitive testing before and after treatment included assessment of verbal memory, specifically recall of spoken words (using the California Verbal Learning Test, Second Edition). Participants also underwent testing of their ability to suppress a response and their cognitive flexibility that allows them to switch back and forth between different tasks - both crucial capabilities in everyday life (employing the Delis-Kaplan Executive Function System Color-Word Interference Test). Subjects were provided with a list of words representing color names (e.g., the word "blue") where they named the color of the ink that varied from word to word. However, if a box framed words, subjects were instructed to read the word instead, changing from one task to a different one and back. The researchers then evaluated improvement between pre- and post-treatment test scores.

Compared with those who received no hormone treatment, athletes in the two estrogen treatment groups taken together had significantly better verbal memory and cognitive flexibility scores at the end of six months than their pre-treatment scores, the investigators reported. The estrogen recipients had greater improvement in both immediate recall of words and in their ability to flexibly switch back and forth between tasks, even

when the researchers controlled for patient age and pre-treatment test scores.

When the researchers evaluated the estrogen treated groups separately versus no treatment, they found significantly greater improvement in certain cognitive tests only in the group that received transdermal estrogen. Baskaran said that transdermal estrogen administration is a more physiologic form of estrogen delivery than the oral preparation. It is also not metabolized in the liver unlike oral [estrogen](#), which may affect other hormone levels that may have affect mental processes.

She stressed that studies in larger patient populations are necessary to confirm their results and to determine if cognition status differs between female athletes who stop menstruating and those who do not.

Provided by The Endocrine Society

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