

Learning deficits in adolescence linked to novel brain receptor

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It is well known that the onset of puberty marks the end of the optimal period for learning language and certain spatial skills, such as computer/video game operation. Recent work published in the journal *Science* by Sheryl Smith, PhD, professor of physiology and pharmacology, and colleagues at SUNY Downstate Medical Center in Brooklyn shows that a novel brain receptor, alpha4-beta-delta, emerges at puberty in the hippocampus, part of the brain that controls learning and memory.

Before puberty, expression of this receptor is low and [learning](#) is optimal. However, at puberty, increases in this receptor reduce [brain](#) excitability and impair spatial learning. Dr. Smith has demonstrated that this learning deficit can be reversed by a stress steroid that diminishes the harmful effects of the alpha4-beta-delta receptors, thereby facilitating learning.

"These findings suggest that intrinsic brain mechanisms alter learning during adolescence, but that mild stress may be one factor that can reverse this decline in learning proficiency during the teenage years," says Dr. Smith. "They also suggest that different strategies for learning and motivation may be helpful in middle school. And it is within the realm of possibility that a drug could be developed that would increase learning ability post-puberty, one that might be especially useful for adolescents with learning disabilities."

In 2007, Dr. Smith and colleagues demonstrated that a hormone

normally released in response to stress, THP, actually reverses its effect at puberty, when it increases activity of the hippocampus. While in adults this hormone acts like a tranquilizer, in adolescents it has the opposite effect, an action that may help to explain [mood swings](#) in teenagers.

The new report on learning deficits published in *Science* by Dr. Smith and colleagues is titled, "A Critical Role for Alpha4-Beta-Delta GABA-A Receptors in Shaping Learning Deficits at Puberty in Mice."

Provided by SUNY Downstate Medical Center

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