MedicalXpress

Study finds cognitive performance can be improved in teens months, years after traumatic brain injury

June 11 2014

Traumatic brain injuries from sports, recreational activities, falls or car accidents are the leading cause of death and disability in children and adolescents. While previously it was believed that the window for brain recovery was at most one year after injury, new research from the Center for BrainHealth at The University of Texas at Dallas published online today in the open-access journal *Frontiers in Neurology* shows cognitive performance can be improved to significant degrees months, and even years, after injury, given targeted brain training.

"The after-effects of concussions and more severe brain injuries can be very different and more detrimental to a developing child or adolescent brain than an adult brain," said Dr. Lori Cook, study author and director of the Center for BrainHealth's pediatric brain injury programs. "While the brain undergoes spontaneous recovery in the immediate days, weeks, and months following a brain injury, cognitive deficits may continue to evolve months to years after the initial brain insult when the brain is called upon to perform higher-order reasoning and critical thinking tasks."

Twenty adolescents, ages 12-20 who experienced a traumatic brain injury at least six months prior to participating in the research and were demonstrating gist reasoning deficits, or the inability to "get the essence" from dense information, were enrolled in the study. The participants were randomized into two different cognitive training groups – strategy-

based gist reasoning training versus fact-based memory training.

Participants completed eight, 45-minute sessions over a one-month period. Researchers compared the effects of the two forms of training on the ability to abstract meaning and recall facts. Testing included pre- and post-training assessments, in which adolescents were asked to read several texts and then craft a high-level summary, drawing upon inferences to transform ideas into novel, generalized statements, and recall important facts.

After training, only the gist-reasoning group showed significant improvement in the ability to abstract meanings – a foundational cognitive skill to everyday life functionality. Additionally, the gist-reasoning-trained group showed significant generalized gains to untrained areas including executive functions of working memory (i.e., holding information in mind for use – such as performing mental addition or subtraction) and inhibition (i.e., filtering out irrelevant information). The gist-reasoning training group also demonstrated increased memory for facts, even though this skill was not specifically targeted in training.

"These preliminary results are promising in that higher-order cognitive training that focuses on 'big picture' thinking improves cognitive performance in ways that matter to everyday life success," said Dr. Cook. "What we found was that training higher-order cognitive skills can have a positive impact on untrained key executive functions as well as lower-level, but also important, processes such as straightforward memory, which is used to remember details. While the study sample was small and a larger trial is needed, the real-life application of this training program is especially important for adolescents who are at a very challenging life-stage when they face major academic and social complexities. These cognitive challenges require reasoning, filtering, focusing, planning, self-regulation, activity management and combating

'information overload,' which is one of the chief complaints that teens with concussions express."

This research advances best practices by implicating changes to common treatment schedules for traumatic brain injury and concussion. The ability to achieve cognitive gains through a brain training treatment regimen at chronic stages of brain injury (6 months or longer) supports the need to monitor brain recovery annually and offer treatment when deficits persist or emerge later.

"Brain injuries require routine follow-up monitoring. We need to make sure that optimized brain recovery continues to support later cognitive milestones, and that is especially true in the case of adolescents," said Dr. Sandra Bond Chapman, study author, founder and chief director of the Center for BrainHealth and Dee Wyly Distinguished University Chair at The University of Texas at Dallas. "What's promising is that no matter the severity of the injury or the amount of time since injury, brain performance improved when teens were taught how to strategically process incoming information in a meaningful way, instead of just focusing on rote memorization."

Provided by Center for BrainHealth