CENTER for BRAINHEALTH®
THE UNIVERSITY OF TEXAS AT DALLAS

Evidence Summary
Strategic Memory Advanced Reasoning Training (SMART)

Gist-based reasoning gives insight into complex cognitive activity — as people grow and age, and even when diagnosed with conditions like attention deficit hyperactivity disorder (ADHD), chronic-phase traumatic brain injury (TBI), or mild cognitive impairment (MCI). Researchers developed the SMART brain training protocol to see if the ability to process complex information could be improved. The goal is to give people strategies and tools to boost brain function and everyday performance.

Strategic Memory Advanced Reasoning Tactics (SMART™) is a neuroscience-based cognitive training program facilitating top-down metacognitive strategies designed to strengthen prefrontal guidance of goal-relevant cognitive operations as opposed to a bottom-up approach of verbatim processing of details. Through SMART, individuals are taught cognitive strategies to promote deeper understanding of information encountered in everyday life. The training is aimed at three cognitive control processes: strategic attention, integrative reasoning and innovation. Strategies facilitate enhanced ability to calibrate mental effort to minimize brain fatigue and engage in deeper-level processing as well as complex reasoning and strategic decision making. The training provides practical ways to employ the tools in a synergistic, integrated manner during real life activities across multiple contexts. Training participants are equipped to identify ways to continually adopt the mental strategies that can enhance core cognitive capabilities.

The training protocol was developed and tested three decades, based on theoretical principles of how information is efficiently encoded, utilized in content absorption, decision making, and communication and applied in real life. The strategies facilitate broad application to academic content, daily life and social/leisure activities. In contrast, traditional cognitive training often targets specific skills (e.g., memory, attention) but not necessarily integrative functions that allow generalization across situations.

Multiple trials funded by the National Institutes of Health (NIH), Department of Defense (DOD) and private philanthropy have demonstrated that SMART can promote gains in core cognitive areas and strengthen several of the brain's key networks – functions that support planning, reasoning, decision making, judgment, and emotional regulation. The program's effectiveness has been tested in multiple populations and remains distinct from other brain training programs, driven by an evidence base that is continuing to build, including studies in:

Population	Published Articles
Healthy Adults	Randomized: *Chapman, Aslan et al., 2015; Chapman et al., 2016, 2017; Gallen et al., 2016; Motes et al., 2018*
	Non-Randomized: *Anand et al., 2010; Chapman et al., 2021; Laane et al., 2022; Zientz et al., 2023*
Adults with TBI or Stroke	Randomized: *Darr et al., 2025; Han et al., 2017, 2018; Han, Martinez, et al., 2018; Samuelson et al., 2020, 2021; Vas et al., 2011, 2015; Venza et al., 2025*
	Non-Randomized: *Vas et al., 2017, 2020*
Typical and disadvantaged adolescents	Randomized: *Gamino et al., 2010*
	Non-Randomized: *Gamino et al., 2014, 2022; Motes et al., 2014*
Children & teens with TBI	Randomized: *Cook et al., 2014*
	Non-Randomized: *Cook et al., 2020*
Adults with Mild Cognitive Impairment	Randomized: *Das et al., 2019; Mudar et al., 2016*
Adults with Bipolar Disorder	Non-Randomized: *Venza et al., 2016*
Adults with Rheumatoid Arthritis	Randomized: *Blalock et al., 2020*
Military Personnel & Law Enforcement	Non-Randomized: *Young et al., 2021*

The following page is a summary of the current body of published evidence for SMART (2010-2025), including:

- 19 small, randomized controlled studies (from 10 distinct RCT protocols)
- 7 non-randomized pilot intervention studies
- 3 pre-post quasi-experimental design studies w/ comparison group (one w/ 900+ study participants)
- 1 case example (from a larger, ongoing intervention study)

In total, the collective body of evidence for SMART to date meets the criteria for Level II evidence.

Published SMART Evidence: A Progression in Depth and Breadth

The earliest published evidence for SMART was demonstrated in a youth population — namely, a randomized controlled trial (RCT) conducted in typical middle school classrooms, including both an active, strategy-based comparison group (bottom-up memory training) as well as an active, information-based control *(Gamino et al., 2010)*.

Soon to follow was a non-randomized pilot study targeted at another non-clinical population — albeit at the other end of the lifespan—cognitively normal senior adults *(Anand et al., 2010)*. Positive findings from this effort, combined with the identified need for top-down cognitive training approaches for individuals with TBI as well as those with mild cognitive impairment (MCI), motivated the initiation of RCTs comparing SMART with an information-based workshop for adults with chronic-stage TBI *(Vas et al., 2011)* as well as senior adults with MCI *(Mudar et al., 2016)*. SMART was also successfully applied to youth with TBI through an NIH-funded RCT employing an active, memory strategy comparison training *(Cook et al., 2014)*, with follow-up work in youth with TBI demonstrating the feasibility for tele-delivery of SMART to increase accessibility *(Cook et al., 2020)*. The potential for neurostimulation to augment the effects of SMART has so far been explored in a randomized pilot trial in adults with MCI *(Das et al., 2019).*

The largest in-person study on SMART to date (over 900 study participants) represented a return to the classroom, a pre-post quasi-experimental design with SMART delivered to 7th and 8th grade public middle school students along with a non-trained typically-developing comparison group *(Gamino et al., 2014)*. These groundbreaking findings across student socioeconomic levels spurred a far-reaching Adolescent Reasoning Initiative aimed at scaling the approach through equipping middle school classroom teachers to deliver SMART (which, to date, has benefitted over 600 teachers, reaching more than 82,000 students across 5 states). A first-of-its-kind EEG study with a subset of these initial student groups demonstrated the transfer of SMART to foundational inhibitory control processes in the brain *(Motes et al., 2014)*. Most recently, evidence of far transfer was demonstrated via students' improved academic performance in all standardized test content areas (Reading, Mathematics, Science, and Social Studies) when compared to untrained peers *(Gamino et al., 2022)*.

Revisiting the successful pilots applying SMART for senior adults, an NIH-funded RCT designed to examine brain changes associated with SMART in healthy senior adults yielded promising evidence through measures of cerebral blood flow, functional connectivity, and white matter integrity *(Chapman, Aslan et al., 2015)*. In subsequent years, four more studies from this RCT protocol would further support the efficacy and utility of SMART for strengthening brain health and performance for older adults. These include a study comparing the distinct contributions of SMART relative to aerobic physical training *(Chapman et al., 2016)*, a study establishing the potential of brain network modularity as a biomarker for predicting response to cognitive training *(Gallen et al., 2016)*, and studies demonstrating SMART's impact on innovative cognition and underlying neural mechanisms *(Chapman et al., 2017)* as well as processing speed-related neural activity *(Motes et al., 2018)*.

During the same time period, a DOD-funded RCT extending the previous work in adult TBI (SMART vs. an information-based workshop) yielded findings across cognitive, psychological, functional, and neural domains — providing evidence suggesting SMART's potential to improve not only trained and untrained aspects associated with cognitive control, but also to enhance psychological health in this clinical population *(Vas et al., 2015).* The positive neural plasticity driving these changes for individuals with chronic-stage TBI was further elucidated through neuroimaging studies of key network connectivity *(Han et al., 2018)* as well as dynamic changes in cortical thickness and functional connectivity *(Han et al., 2017).* This RCT also yielded novel findings informing the neural correlates of reduced depressive symptoms following cognitive training *(Han, Martinez, et al., 2018).* A similar RCT protocol has since been implemented by independent investigators at the University of Colorado-Colorado Springs in military veterans with TBI and/or PTSD *(Samuelson et al., 2020, 2021).* Most recently, SMART has been compared against a standard cognitive rehabilitation protocol (SCORE) for active-duty service members with mild TBI expressing persistent cognitive complaints and varying levels of PTSD symptoms. Both SMART and SCORE groups showed significant improvements in higher-order cognitive abilities such as complex memory and strategic learning. Notably, SMART participants achieved these outcomes in one-third of the treatment hours, relative to SCORE, speaking to not only its effectiveness as a cognitive rehabilitation protocol but also to its cost effectiveness (*Darr et al., 2025; Venza et al., 2025*).

SMART is also being implemented with success in the context of chronic stroke recovery *(Vas et al., 2017, 2020).* Perhaps the most novel clinical populations for which SMART has been applied are adults with Bipolar Disorder, as exemplified in a non-randomized pilot intervention study yielding positive cognitive and neural findings *(Venza et al., 2016)* as well as adults with rheumatoid arthritis, the latter addressed in the context of an RCT on medical decision making at the University of North Carolina at Chapel Hill *(Blalock et al., 2020).* Most recent efforts have been to translate SMART outside of the laboratory to inform scalability, first in military/veterans and law enforcement populations *(Young et al., 2021)* and now using an online platform, both for generally healthy adults through The BrainHealth Project *(Chapman et al., 2021; Laane et al., 2022)* as well as adults in the workplace (*Zientz et al., 2023).*