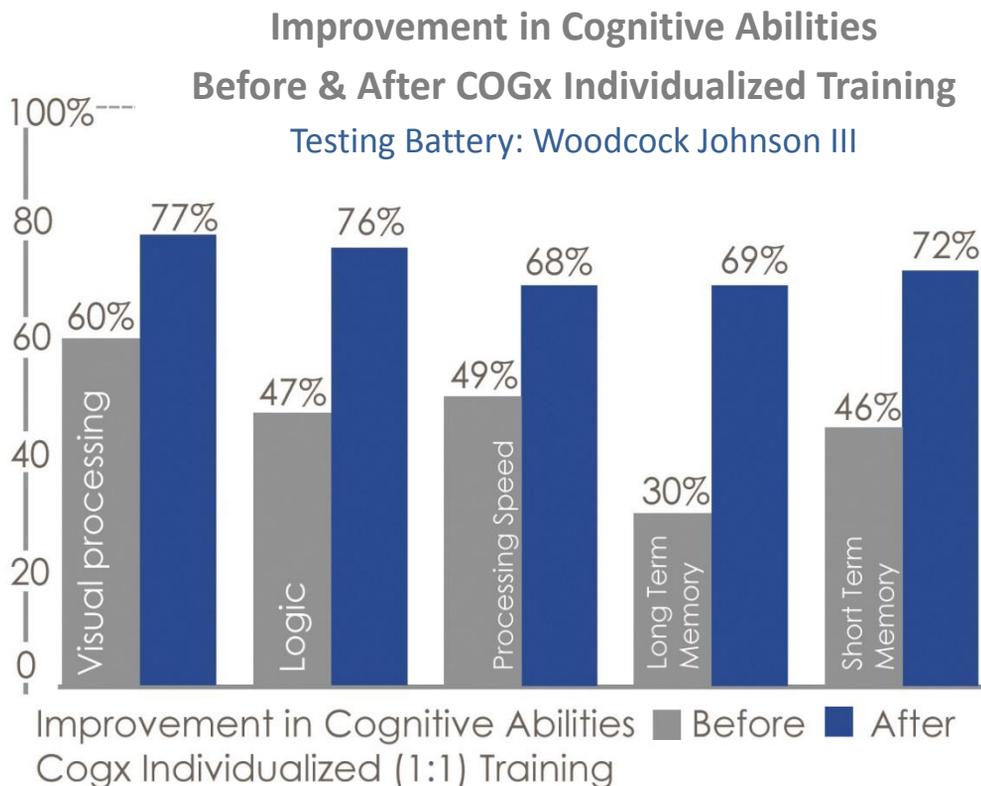# COGx Individualized Cognitive Training to Enhance Learning: Efficacy & Results

The COGx methodology has succeeded with students across dozens of schools in the United States, representing a wide mix of ages and abilities. It consistently generates meaningful results, validated clinically through neuropsychological evaluations as well through improved learning ability evidenced in the classroom.

COGx has established on-site programs at schools, a partnership with a leading research organization, is affiliated to the most prestigious programs in neuroscience, is recommended by doctors and hospitals, and has a growing

Improvement in Cognitive Abilities Before & After COGx Individualized Training

Testing Battery: Woodcock Johnson III

- Visual processing: Before 60%, After 77%
- Logic: Before 47%, After 76%
- Processing Speed: Before 49%, After 68%
- Long Term Memory: Before 30%, After 69%
- Short Term Memory: Before 46%, After 72%

Improvement in Cognitive Abilities ▪ Before ▪ After
Cogx Individualized (1:1) Training

The chart represents the aggregate results of 343 students who received individualized cognitive training. The results are measured using Woodcock Johnson III, a clinical and independent battery of tests. These cognitive abilities correlate directly to learning ability. The combination of quantitative data and qualitative results show how personalized the approach is and how effective it is across a broad range of ages, ability-level and unique needs.

The following pages contain six sample case studies showcasing the breadth of programs the methodology is equipped to undertake.

1. Target Memory (storage and retrieval) for a 13 year old student performing well in a top school.

2. Improve focus, memory and attention for a 6 year old student with learning disabilities.

3. Address "brain fog" for an 18 year old student with POTS (medical condition) and raise processing speed.

4. Improve confidence, accuracy and speed for a 16 year old student.

5. Raise executive function and metacognition to reduce impulsivity, learn to self-regulate while lifting attention and memory on 13 year old student.

6. Improve ability to problem solve, initiate and complete tasks as well as recall information for 16 year old student.

Improve ability to efficiently store and retrieve learned information (memory)

CASE DETAILS

Profile: SA, a 13-year-old female, enrolled for 50 hours of training. SA's program was customized to exclusively target memory, as all other cognitive skills were well above average (88th percentile and above). The exception to SA's cognitive strength was memory: Long-Term Memory (9th percentile) & Short-Term Memory (74th percentile).

> " I definitely feel my memory improved & I'm glad I learned these strategies. I definitely think I can use what I learned to help me in school. "
> – SA

Skill Targeted	Pre	Post
Long-Term Memory	9th %	99th %
Short-Term Memory	74th %	99th %

COGx APPROACH & RESULTS

Identifying the root cause of SA's Long-Term Memory (LTM) weakness was the first goal of training, and it became clear through specific exercises that visualization was playing a role. SA was not utilizing this skill because it was weak and unreliable. Visualization is crucial to the processes of storing and recalling information, and strengthening this became a central focus of training.

At first, SA was able to visualize only with much prompting and coaching. Soon this skill was very strong and SA was visualizing automatically within exercises. Related to what we were working on with visualization is the technique of making associations. SA's memory became very powerful as the skills of visualization and making associations were strengthened.

Armed with these techniques, SA started to excel and require less prompting within exercises. The goal was to convert visualizing and making associations from something new and novel to something SA did inherently in response to new information.

The most meaningful work we did was in the latter half of SA's program, when we transitioned to *generalization*. One of the first things we attempted was the Periodic Table, which SA selected with the parameters that it was both relevant and something that she doubted she could learn and remember. In a real show of progress, SA opted to apply a technique that is entirely visualization-based. It became clear that this was her greatest tool as she moved through blocks of the table with ease. When SA didn't know something, she immediately went back and "patched" it for next time. This skill of patching a memory was something we worked on and is something SA now does automatically as a habit.

SA mastered several memory techniques and study skills strategies over the course of her targeted program and has indicated that she is actively applying what she has learned to her school work.

Improve focus, retention and comprehension

CASE DETAILS

Profile: SK, a 6 year old student, enrolled in 90 hours of cognitive training.

> " Now I know that if I pay attention, concentrate, and stay quiet and just focus on my work I get things done. I am proud of coming here and having a good time and proud of you (trainer) for helping me get smarter. I like being here. I like this brain training. I will miss it and miss you every day. "
>
> – SK

Skill Targeted	Pre	Post
Long-Term Memory	22nd %	55th %
Processing Speed	15th %	41st %

COGx APPROACH & RESULTS

When SK's program began, it was extremely difficult for the trainer to arouse SK's interest and hold his attention. Being unfamiliar with the program and his trainer, SK was particularly unwilling to participate. To encourage SK, his trainer inserted a reward system. This reward system allowed the trainer to execute sessions successfully. Once SK was on board, his trainer was able to target SK's impulsivity and attention issues directly by incorporating heavy usage of a metronome throughout each applicable exercise. Memory exercises were customized to incorporate SK's highly visual capabilities, and allowed his trainer to successfully teach and coach SK on how to use memory techniques. Despite being so young and overactive, SK was able to grasp the concepts being taught to him and excel.

For SK, it was critical to involve him in learning and in a positive and rewarding way. Through efforts of his trainer, paired with ongoing success during sessions, SK's motivation and confidence grew in synch with the strengthening of his cognitive skills. SK's memory improved so much with the implementation of technique, that towards the end of his program he was able to properly store more than 2 times the amount of information than before.

Compared to the start of SK's program, the final sessions were a dramatic improvement. SK was not only enthusiastic and eager to participate, but not wanting to leave when sessions were over. SK's attention and impulsivity were much more regulated, allowing his memory to properly intake information and retain it. SK's desire to learn and apply all that he learned during training was extremely rewarding for everyone involved.

Quote from SK's Trainer: "SK made a transformation in my eyes, and most importantly, SK transformed the way he viewed himself. SK discovered his strengths, his capabilities, and learned how to apply them to his weaknesses. For a 6 year old to make those sort of improvements *now*, gives me the confidence that SK will continue to succeed in the future."

Improve ability to process and retain information (processing speed & memory)

CASE DETAILS

Profile: JS, an 18-year-old female high school junior enrolled in COGx for a 60-hour training program. JS enrolled due slow processing speed and a learning disability. JS also reported occasional "brain fog" that is a result of a medical condition (POTS).

> " JS feels she got a lot out of training and even wanted to continue after her program was completed.
> – JS Parent "

Skill Targeted	Pre	Post
Delayed Retrieval	28th %	64th %
Decision Speed	21st %	39th %

Pattern recognition and problem solving ability also improved significantly

COGx APPROACH & RESULTS:

JS's main goals entering into the COGx training program were improved processing speed and memory, with a particular focus on improving speed of work. As one might predict, the memory improvements came in short bursts, as JS familiarized herself with new techniques, before eventually perfecting them. We covered several such techniques, which JS has learned to apply to relevant education and real-world scenarios. Processing speed improvements, on the other hand, came slowly and as a result of constant drilling.

JS began learning memory techniques with the linking and number peg methods. It was useful to use these two techniques in parallel, as they rely on similar principles of visualization. However, where JS excelled at linking, her excellent numeric fluency made it difficult for her to learn the number peg system (since she was already skilled at remembering numbers without a technique). Still, JS's imagination and quick creative thinking became strong assets here; she was able to quickly invent stories to connect — and thus, remember — numbers, dates, objects, places, and events. JS also learned the Gettysburg Address with the method of loci, a related, but distinct technique.

In addressing JS's memory, we also worked on processing speed by progressively lowering the amount of time she had available to remember the necessary information. This, in addition to other timed drills, has led over time to a significant improvement in JS's ability to quickly process and respond to information. Most importantly for practical purposes, the combination of memory improvement with processing speed gains should improve JS's speed of work, including completing assignments more quickly. In using memory techniques, she should be able to reduce the on-line cognitive burden of writing, relying instead on previously encoded information. Meanwhile, her newly improved processing speed will allow her to more quickly act upon that knowledge.

Quote from JS: "COGx was great test prep. It helped me to do surprisingly well on my practice ACT."

Improve confidence and slow work (processing speed)

CASE DETAILS

Profile: KC, a 16-year-old male high school junior, enrolled in COGx for a 60-hour training program. KC has extremely low self-confidence and slow work.

> " KC is showing more of a willingness to speak up, even when he is less than 100% positive of his answer.
> – KC's Parents "

COGx APPROACH & RESULTS:

KC's goal entering into COGx was improved processing speed along with improved confidence. These issues were interrelated. KC was keenly aware that he has an issue with processing speed, which impacts his confidence. His low self-confidence, in turn, seems to feed back into his already somewhat slowed processing, forcing him to constantly second-guess himself and slowing him down even more.

Work on processing speed began with a variety of exercises designed to constrain the time KC had available to take actions and make decisions. These included visual and auditory processing exercises and targeted domains such as math, mental manipulation, and response selection. At first, KC was often extremely frustrated when, by his own estimate, he had failed to live up to trainer expectations. He was doing absolutely fine, but his high standards for himself combined with his low self-confidence left him crippled.

Soon, however, KC began to trust that when his trainer told him he was doing well, he was. This honest feedback was able to break through the negative feedback loop, convincing KC that his performance was often excellent. He was able to build on these successes, stringing them together impressively. Some of his best moments involved memory techniques. He learned several, but his most successful was the memory palace. Using this technique, he learned the Preamble to the US Constitution, the poem "Litany Against Fear" from Frank Herbert's *Dune*, and the Miranda Rights. KC proved to be particularly skilled at this technique, developing vivid scenes in his imagination that allowed him to greatly expand his storage limit. More importantly, he realized that he was good at this. KC's success with the memory palace led to further successes in other, previously weaker areas, particularly in processing speed. He came to realize that it was ok to guess sometimes, and to not be 100% sure of an answer when giving it. His steadfast commitment to the program was a huge asset in the successes he has had with his COGx program.

Improve impulsivity (self-regulation), attention and memory

CASE DETAILS

Profile: AS, a 13-year-old male seventh grader enrolled in COGx for a 60-hour training program

> " I can use the different peg systems in order to help remember information from school. I use mnemonics to remember words from my vocabulary list. I like creating links in order to remember large amounts of information. "
>
> – AC

CLINCAL EVALUATION RESULTS:
Slowed down impulsivity by calibrating processing speed with analytical ability – lowered response time and improved accuracy of responses.
BRIEF (Executive Function) results showed improvements in self-regulation, inhibition, organization and planning as well as in time-management as reported by teachers, parents and self (student).

Skill Targeted	Pre	Post
Delayed Retrieval	28th %	80th %

COGx APPROACH & RESULTS

AS worked on his impulse control and attentiveness by completing tasks with the metronome. The metronome was used to monitor the speed at which he completed the tasks which kept him consistent while completing whatever task he was asked to complete. The initial focus was for AS to complete these tasks perfectly. Over time, these tasks became more tedious and required more attentiveness. By the end of training, he was working on increasing the difficulty of the task while also increasing the amount of time he could complete a task perfectly. This really pushed AS to pay attention to a very tedious task for extensive periods of time.

AS came up with different peg systems that he can use to help him recall various information. For example, AS came up with different associations between numbers and objects in order for him to recall numbers. This peg system could then be used when he was trying to remember any information that was relevant to the number or the word associated with a number. He was able to create other peg systems which he can also use to help him remember and recall information more efficiently.

Even though he wanted to complete tasks quickly, he realized that he had to initially focus on accuracy. Once his accuracy improved, he was then able to focus on completing the task more quickly. Another method used to improve AS's accuracy was by decreasing the speed of the metronome with certain tasks. We would work on the same task repeatedly and then increase the speed over time. This allowed for him to eventually complete tasks with 100% accuracy at a faster pace than he had previously been able to complete the task.

Improve ability to problem solve, initiate and complete tasks as well as recall info.

CASE DETAILS

Profile: BL, a 16-year-old male high school sophomore enrolled in COGx for a 60-hour program.

> " Processing speed had been the most challenging issue for him going back, and with college placement we were concerned about this being an issue. I have seen my son improve in memory and processing speed. He used to struggle more on the math component. "
> – BL Parent

Skill Targeted	Pre	Post
Long-Term Memory	1st %	23rd %
Logic & Reasoning	50th %	82nd %
Processing Speed	11th %	29th %

COGx APPROACH & RESULTS

BL's main goal with COGx was to improve his processing speed, in order to help him complete assignments faster. We dove into this from the outset of his program, focusing on exercises that are timed with a stopwatch or paced with a metronome, both of which demand, in their own ways, a strict adherence to a preset speed. At first, BL often struggled with this, impeded by his desire to get everything absolutely correct, and his frustration at his inability to do that. Over time, though, BL learned to first sacrifice some accuracy for improved speed, and later to build accuracy back up to previous levels. This cycle was repeated (alternatingly building accuracy and speed) for several iterations, until BL had reached high performance criteria in a variety of tasks in both math-related and verbal domains. Complexity was added over time, to address BL's goal of improved problem solving.

Through all this work, it was critical to vary BL's assigned tasks as much as possible, to minimize the risk of "practice effects" — improved performance on a certain exercise that is not necessarily reflective of a more generalized boost to the underlying cognitive skill. By training processing speed in a wide variety of contexts, BL was able to improve the ability to quickly process information, and will be able to apply this improved skill. In one applied example, a writing exercise we occasionally used forced him to very quickly generate and expand upon ideas to respond to a particular task, an improvement he will carry forward with him.

In working on his processing speed issues, it came out that BL struggles sometimes with long-term associative memory. In particular, he was often unable to remember pairs or groups of items that were not clearly conceptually linked. BL found the *linking* memory technique useful only when he could verbally explain his links. He was encouraged to rely increasingly on his visualization ability by limiting his verbal response first to just one word, and then to nothing at all. This allowed BL to acquire the skill in a manner suited to his talents. By the end of the program, BL had acquired several useful memory skills, and the ability to deploy them quickly.

BL: "Note taking has gotten better. More organized and quicker. I can process information that comes in auditory and visually better than before. My enhanced memory is something I've used a lot for my German class. I used to be a B or B+ and this moved to an A. I was able to use the memory palace technique to my law class as well."

Individual Student Results
COGx 1:1 Cognitive Training
Greater Washington DC Area Learning Center Study

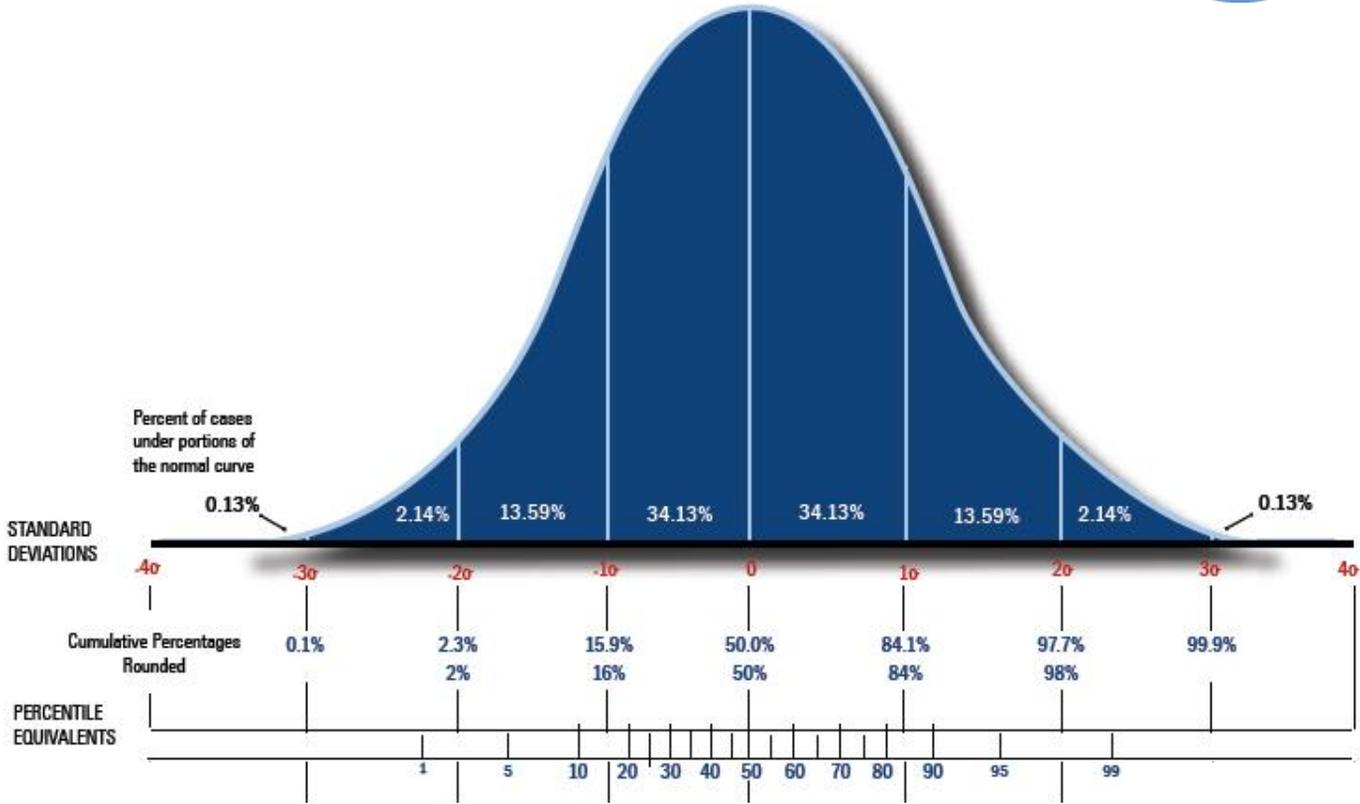### Individual Student Gains Delivered for Our Clients

On analysis of the results for we found that on average we have closed 42% of the gap for students completing our program for individualized cognitive training. The gap is the difference between a student's starting position and the highest possible score. This means that if a student has a skill in the 50th percentile we are seeing an improvement of about 21 percentile points.
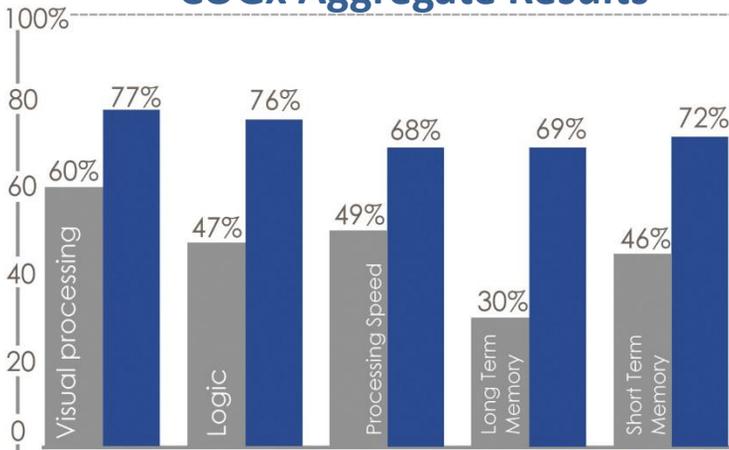
How gains were measured?

Students received an independent, clinical assessment using **Woodcock Johnson III** battery of tests in order to measure their cognitive ability before and after the evaluation. Wherever possible we compiled the parents initial concerns, goals and comments offered for the outcomes.

The following pages showcase some individual results for the students for which we have permission to share the results. The data is a subset of a group of 88 students that received individualized cognitive training with COGx. The program durations varied based on their needs.

Cognitive Testing: Normal Distribution

Percent of cases under portions of the normal curve

| | 0.13% | 2.14% | 13.59% | 34.13% | 34.13% | 13.59% | 2.14% | 0.13% |

STANDARD DEVIATIONS
-4σ -3σ -2σ -1σ 0 1σ 2σ 3σ 4σ

Cumulative Percentages Rounded
0.1%   2.3%   15.9%   50.0%   84.1%   97.7%   99.9%
       2%   16%   50%   84%   98%

PERCENTILE EQUIVALENTS
1   5   10   20   30   40   50   60   70   80   90   95   99

COGx Aggregate Results

Improvement in Cognitive Abilities ■ Before ■ After
Cogx Individualized (1:1) Training

- Visual processing: 60% → 77%
- Logic: 47% → 76%
- Processing Speed: 49% → 68%
- Long Term Memory: 30% → 69%
- Short Term Memory: 46% → 72%

Cognitive Area Tested	COGx Average Percentile Gain
Long-Term Memory	39
Logic & Reasoning	29
Short-Term Memory	26
Processing Speed	19
Visual Processing	17