5th Edition

RESEARCH RESULTS & CLIENT OUTCOMES

BrainRx®

BrainRx®

Prepared by

Amy L. Moore, PhD

Cognitive Psychologist

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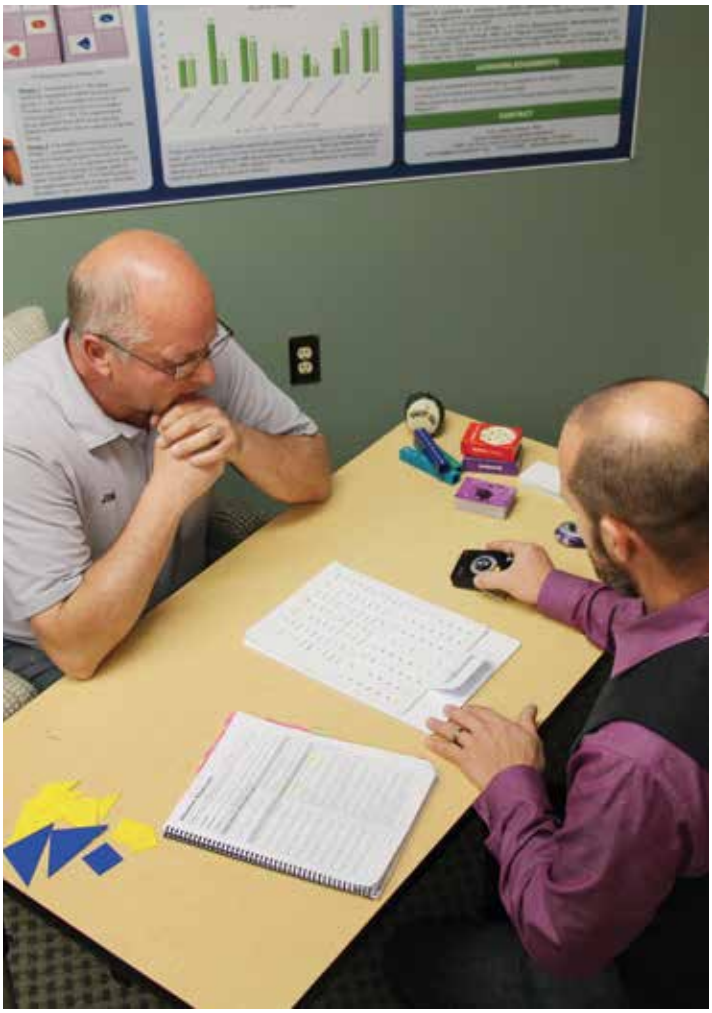
FOREWORD

Executive processing is dependent upon the collective interplay of brain networks underlying fundamental cognitive skills. In many ways, one's executive processing is only as strong as one's weakest cognitive skill. Cognitive training offers the most promising method for strengthening underlying cognitive networks, allowing one to increase overall executive processing ability!



However, not all cognitive training programs are alike! BrainRx is distinct in many ways from the variety of digital training programs available today. Foremost, BrainRx programs are delivered by a trainer who gives dynamic feedback throughout every training session. Further, BrainRx programs are based on the Cattell-Horn-Carroll theory of intelligence, a widely-accepted view of cognition and the theoretical foundation of modern-day cognitive assessment. BrainRx is comprehensive; targeting and training seven key cognitive skills and multiple sub-skills. It is also highly intensive, including an average of 72 to 144 hours of training over several months.

We are now using MRIs to visualize the underlying changes in brain structure and function after our training. In several research studies, we looked at underlying changes related to gains in cognitive test scores and found correlated changes in functional connectivity! In other research, we found normalization of key brain networks after training with BrainRx.

The dynamic feedback, thoroughness, and intensity of BrainRx cognitive training are keys to producing modifications of cognitive skill networks and the desired functional cognitive gains. It is certainly an exciting time to be in the field of cognitive training research.

Christina Ledbetter, PhD
Clinical Neuroscientist
LSU Health Sciences Center
President, Gibson Institute of Cognitive Research

INTRODUCTION

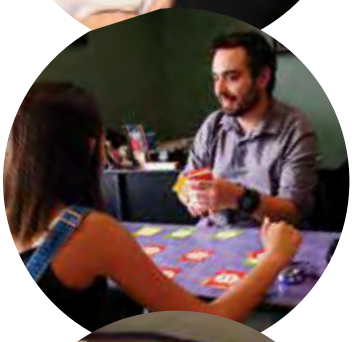
Since 1985, Dr. Ken Gibson and his colleagues have helped more than 121,000 clients with a unique cognitive training methodology designed to remediate deficits in multiple underlying learning skills. Dr. Gibson devoted his entire career to helping children and adults with learning struggles, beginning first with a visual information processing intervention and later restructuring the program to include auditory processing, memory, attention, processing speed, and reasoning training procedures. With input from a team of psychologists, educators, speech and language pathologists, and occupational therapists, Dr. Gibson continuously studied the results of learning and cognition research to develop an intensive reading intervention, a math intervention, and a reading comprehension intervention that have complemented the original training program.

In 2014, he also emphasized building an empirical research base that supports the cognitive training procedures and assessments used by LearningRx and BrainRx brain training centers, and to the continued development and testing of cognitive training program components. He established the Gibson Institute of Cognitive Research (GICR) to accomplish those goals. In 2019, GICR became a 501c3 nonprofit research organization dedicated to examining cognitive training and assessment protocols and methods, and to researching neuropsychological, genetic, and lifestyle factors that are associated with cognition and learning across the lifespan.

Gibson Institute's President, Dr. Christina Ledbetter, and I are committed to continuing Dr. Gibson's legacy by partnering with the esteemed community educators, clinicians, and researchers who serve on the Board of Directors at GICR and on the Scientific Advisory Board with us. This report is one of the recurring projects we manage. It summarizes the research on LearningRx and BrainRx programs and provides an overview of the our client outcomes from 2010 to 2022.

Amy Lawson Moore, PhD

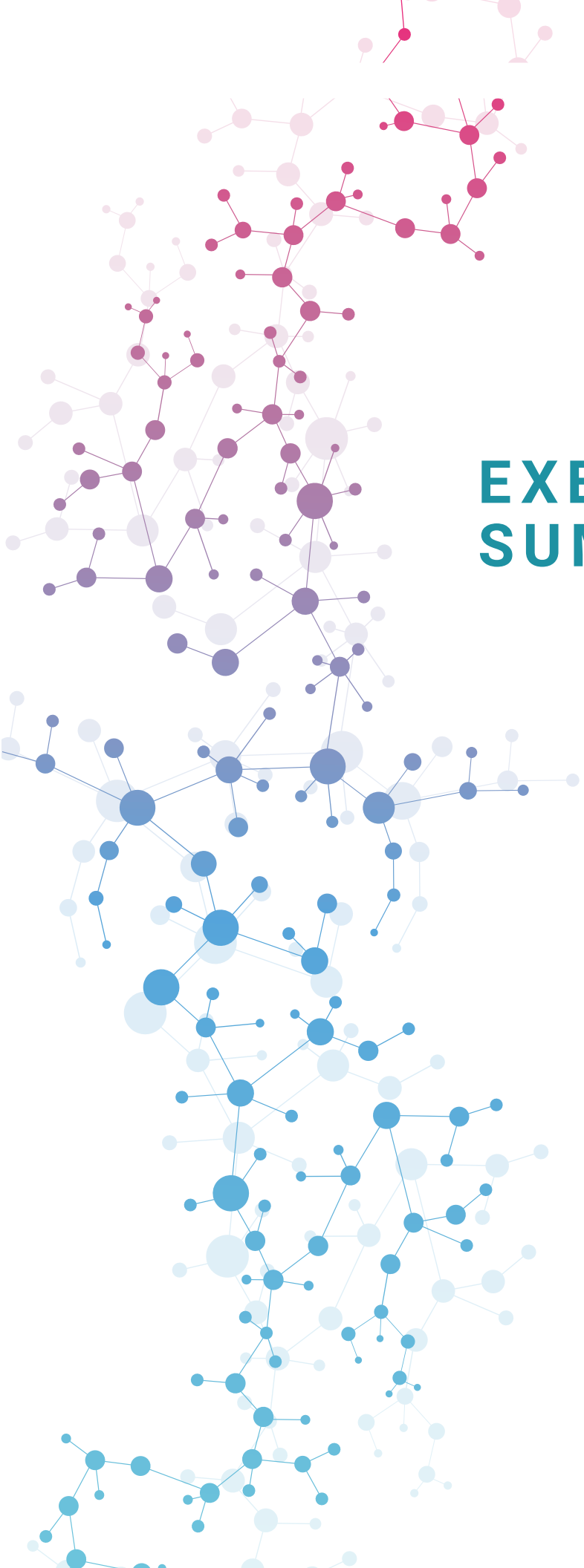
Cognitive Psychologist at LearningRx and VP of Research at Gibson Institute of Cognitive Research









EXECUTIVE SUMMARY

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Introduction

BrainRx cognitive training programs target attention, processing speed, working memory, long-term memory, auditory processing, visual processing, and logic & reasoning through repeated engagement in game-like mental tasks delivered one-on-one by a clinician or trainer. Our intensive reading and math interventions are also delivered through a cognitive training approach based on The Learning Model developed by Dr. Ken Gibson.

Background

Since 1985, our brain training methodology has been used with more than 121,000 clients at private clinical practices and in brain training centers in the United States and around the world. BrainRx works with clients of all ages regardless of prior diagnosis, including those with dyslexia, ADHD, traumatic brain injury, autism spectrum disorders, speech and language delays, learning disabilities, and age-related cognitive decline.

Report Objectives

- To summarize both the quantitative and qualitative results of formal research studies conducted on BrainRx methods
- To evaluate the training outcomes for all LearningRx and BrainRx clients between 2010 and 2022

Data Collection

The results from our training were obtained through the following:

- Pre and post standardized testing of 27,790 clients using the Woodcock-Johnson family of tests, the Gibson Assessment of Cognitive Skills, and the Kaufman Tests of Educational Achievement.
- Neuroimaging with functional magnetic resonance imaging (fMRI) in 4 research studies
- Quantitative testing results in 19 research studies using gold-standard assessments including the Woodcock Johnson III Tests of Cognitive Abilities and Tests of Achievement, Woodcock Johnson IV Tests of Cognitive Abilities, Delis Kaplan Executive Function System (DKEFS), Test of Nonverbal Intelligence (TONI-4), Conners Continuous Performance Test (CPT-3), Dementia Rating Scale (DRS-2), Montreal Cognitive Assessment (MoCA), Learning Skills Rating Scale (LSRS), and Gibson Test of Cognitive Skills
- Survey data of behavioral outcomes in 2 research studies that included Behavior Rating Inventory of Executive Function (BRIEF-A) and Patient Competency Rating Scale (PCRS)
- Qualitative data from intake and exit interviews in 7 research studies
- Qualitative data from graduate exit surveys in 5 research studies

Quantitative Results from Randomized Controlled Trials

IQ Score. BrainRx training led to an average IQ score gain of 21 points for children and teens with learning struggles, and an average 26-point IQ score gain for children and teens with ADHD.

Logic & Reasoning. BrainRx training led to average logic & reasoning gains of 28 points for children and teens with learning struggles, and 27 points for children and teens with ADHD.

Working Memory. BrainRx training led to average working memory gains of 13 points for children and teens with learning struggles, and 20 points for children and teens with ADHD.

Long-Term Memory. BrainRx training led to average long-term memory gains of 28 points for children and teens with learning struggles, and 34 points for children and teens with ADHD.

Processing Speed. BrainRx training led to average processing speed gains of 13 points for children and teens with learning struggles, and 16 points for children and teens with ADHD.

Auditory Processing. BrainRx training led to average auditory processing gains of 13 points for children and teens with learning struggles, and 15 points for children and teens with ADHD.

Visual Processing. BrainRx training led to average visual processing gains of 11 points for children and teens with learning struggles, and 5 points for children and teens with ADHD.

Neuronal Connections. BrainRx training led to significant changes in neuronal connections and global network efficiency measured by fMRI.

Transfer Effects from Randomized Controlled Trials

Transfer Effects for Children with ADHD. Children and teens with ADHD reported transfer to improved confidence, cooperative behaviors, and self-discipline.

Transfer Effects for Children with Learning Struggles. Children and teens with learning struggles reported transfer to improved academic skills, self-esteem, relationships, and self-discipline.

Transfer Effects for At-Risk High Schoolers. Training gains transferred to improved attitudes about math for high schoolers who completed a Brainskills program.

Quantitative Results from Controlled Studies, Quasi-Experimental Studies, and Pilot Trials

Cognitive Skills. School-aged participants achieved significantly higher gains than the control group on working memory, associative memory, logic & reasoning, processing speed, auditory processing, and Word Attack scores.

Academic Difficulty. Three thousand five hundred twenty-seven children averaged a 4.1 year gain across reading skills, including a 5.8 year gain in phonological awareness. Parent ratings of 178 school-aged participants showed that those who completed our brain training experienced less academic difficulty afterwards, while academic difficulty in the same time period for children in a control group actually increased.

Oppositional Behavior. Parent ratings of 178 school-aged participants showed that those who completed our brain training experienced less oppositional behavior afterwards, while oppositional behavior in the same time period for children in a control group actually increased.

Traumatic Brain Injury. Soldiers with TBI achieved clinically significant changes in working memory, IQ score, auditory processing, long-term memory, auditory working memory, and logic & reasoning following our cognitive training; and 10 of the 11 soldiers who completed the study achieved overall recovery.

Delivery Method. Studies revealed no statistically significant differences in outcomes based on program delivery method comparing clinician-only delivery versus shared delivery between clinician and spouse/caregiver, comparing 100% clinician delivery versus 50% clinician-delivery/50% digital, or comparing remote delivery versus in-person delivery during COVID-19.

Transfer Effects from Controlled Studies, Quasi-Experimental Studies, and Pilot Trials

Transfer effects for Brain Injury. Adults & adolescents with brain injury reported transfer to real-life improvements including increased confidence and perseverance, as well as improved attention, memory, affect and mood, motivation, school and work performance, social identity, activities of daily living, and outlook on life.

Transfer Effects for Adults Over 50. Adults reported improvements in mood, work performance, driving, hobbies and sports, problem-solving, anxiety, confidence, hope, outlook, memory, and focus.

Transfer Effects for School-Agers. Parent ratings showed that school age children who completed our brain training experienced less oppositional behavior afterwards and showed improved math, reading, and writing skills, better grades and academic performance, improved confidence, personal responsibility, social skills, and mood/outlook.

Transfer Effects for Mild Cognitive Impairment (MCI). Seniors with varying severity of cognitive impairment who completed our training reported improved social interactions, marital relationships, restoration of hope, confidence to return to school and work, and decreased depression.

Results from Analyses of Client Outcomes

Cognitive Results. Among all 27,790 clients between 2010 and 2022, the average change in IQ score was 14 points for both children and adults across all programs, with individual program gains ranging from 11 to 17 IQ points following training. The mean cognitive skill gains overall ranged from 9 to 15 points for both children and adults. All changes were statistically significant. The results of each cognitive skill change by age group and program are in the following table:

COGNITIVE SKILL STANDARD SCORE GAINS BY AGE GROUP FOR GRADUATES IN EACH PROGRAM

	BrainRx		ReadRx		MathRx		
Score	Child	Adult	Child	Adult	Child	Adult	Skill Average
LTM	14	16	13	14	14	15	14
VP	8	10	8	10	8	9	9
AP	11	10	13	15	11	12	13
LR	11	9	11	10	12	9	10
PS	8	8	8	8	9	9	9
WM	10	10	9	11	10	11	10
Attn	12	12	12	14	12	13	12
IQ	14	13	14	12	14	13	13
Program Average	11	11	11	12	11	11	

Reading Results. Among the 13,264 reading program clients between 2010 and 2022, the group average for basic auditory processing skills at pretest was in the 58th percentile and the group average at post-test was in the 77th percentile. For children, the average age-equivalent change across all reading skills was 3.2 years, with the largest gain of 5.7 years in Sound Awareness following training. All changes were statistically significant.

Math Results. Among the 3,982 MathRx program clients between 2010 and 2022, the group average for reasoning skills at pretest was in the 38th percentile and the group average at post-test was in the 60th percentile. For children, average gain in math skills was 2.8 years, with the largest gain of 3.2 years in Quantitative Concepts following training. All changes were statistically significant.

In an analysis to control for placebo effects, MathRx clients made nearly twice the gains on math achievement tests than ReadRx students made on math achievement tests—illustrating the targeted effects of the math program.

Cognitive Results by Diagnosis. The average standard score change overall for clients with a pre-existing diagnosis ranged from 9 to 11 points, with changes in individual skills ranging from 9 points to 14 points. All changes were statistically significant. The results of each cognitive skill change by diagnostic category are in the following table:

STANDARD SCORE GAINS BY DIAGNOSIS FOR ALL AGES

Score	ADHD	Dyslexia	LD	Speech	Autism	TBI	Adults 50+	Skill Average
LTM	14	13	13	12	12	15	14	13
VP	8	8	8	8	8	9	8	8
AP	12	12	12	12	12	10	8	11
LR	11	11	11	11	10	9	9	10
PS	9	8	9	9	10	10	6	9
WM	10	9	10	12	10	10	9	10
Attn	12	11	11	10	10	10	7	11
IQ	14	13	13	13	13	13	11	13
Diagnosis Average	11	11	11	11	11	11	9	

Retention. Follow-up testing of 2,383 clients 16 months after training showed retention rates ranging from 97% to 99% in all cognitive areas, including IQ score, logic & reasoning, memory, attention, processing speed, visual processing, and auditory processing.

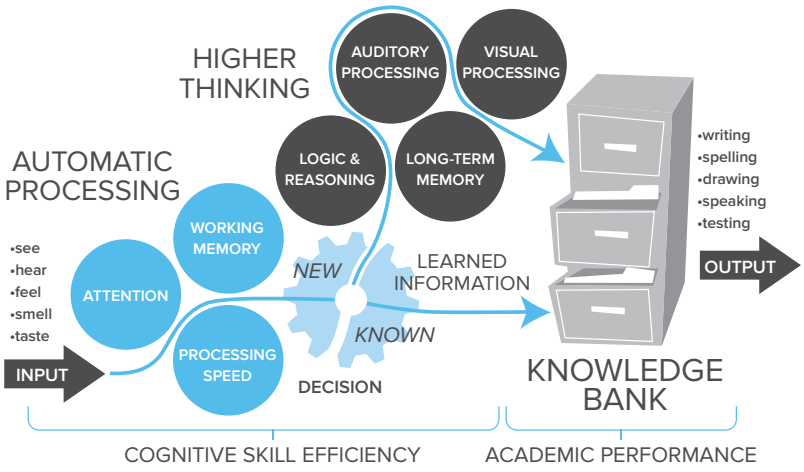
Conclusion

Our training outcomes are consistent across research study designs and subgroups. Analyses of client outcomes reveal similar trends in statistically significant changes from pretest to post-tests across age groups and diagnostic categories. A convergence of evidence points to program efficacy, improved cognition, and transfer to real-life improvements.

ABOUT OUR PROGRAMS

THE SCIENCE BEHIND OUR BRAIN TRAINING PROGRAMS

The Learning Model is grounded in the Cattell-Horn-Carroll (CHC) theory of intelligence, which describes thinking as a set of seven broad abilities: comprehension knowledge, long-term retrieval, visual-spatial thinking, auditory processing, fluid reasoning, processing speed, and short-term memory.



According to the Learning Model, an individual takes information in through the senses (input) that must be recognized and analyzed by the active processing system (working memory, processing speed, attention). This executive control system determines which information is unimportant, easily handled, or requires thinking. Unimportant information is discarded from working memory. If the input contains important information about data that have already been stored in the knowledge bank, it is quickly retrieved and converted to output, such as speaking or writing.

If the information has not been previously stored, higher thinking processes must then occur. Reasoning, auditory processing, and visual processing must be used to solve the problem or complete the task. If the task is practiced often enough, however, the information is stored in the knowledge bank, which will decrease the time between input to output. This occurs because the higher thinking processes can then be bypassed.

SEVEN KEY COGNITIVE SKILLS

- **Attention:** Focus over time, despite distraction, or while multitasking
- **Processing Speed:** Think and perform tasks quickly and accurately
- **Working Memory:** Hold on to and use information during the learning process
- **Auditory Processing:** Distinguish, blend, and segment sounds accurately
- **Visual Processing:** Create and picture mental images while thinking or reading
- **Logic & Reasoning:** Reason, form ideas, and solve problems
- **Long-Term Memory:** Efficiently recall facts and stored information

BRAINRX COGNITIVE TRAINING

BrainRx cognitive training programs target and remediate seven primary cognitive skills and multiple sub-skills through repeated engagement in game-like mental tasks delivered one-on-one by a clinician or cognitive trainer. The tasks emphasize visual or auditory processes that require attention and reasoning throughout each 60- to 90-minute training period. Using a synergistic "drill for skill" and metacognitive approach to developing cognitive skills, the program incorporates varying levels of intensity, hierarchical sequencing of tasks, multiple-task loading, and instant feedback from the clinician or trainer. Training sessions are focused, demanding, intense, and tightly controlled by the clinician or trainer to push students to just above their current cognitive skill levels. Deliberate distractions are built in to the sessions to tax the brain's capacity for sorting and evaluating the importance of incoming information. This ability to correctly handle distracting information and interruptions is the foundation for focus and attention skills.

THE SEVEN KEY INGREDIENTS OF EFFECTIVE BRAIN TRAINING

Brain training must be practiced. Because brain training builds skills, it can't be taught in the classroom. It must be practiced, like learning to play tennis or the piano.

Brain training that gets the best results is done with a personal trainer. Teaming with an experienced trainer provides accountability, motivation, and—ultimately—life changing results.

Brain training exercises need to be intense, requiring concentrated repetitions in order to train skills quickly.

Brain training exercises need to be targeted in order to address specific weak cognitive skills.

Brain training exercises need to be done in a particular sequence. Small challenging steps don't overwhelm the client, but allow the trainer to continually challenge the client incrementally and keep them engaged in the training.

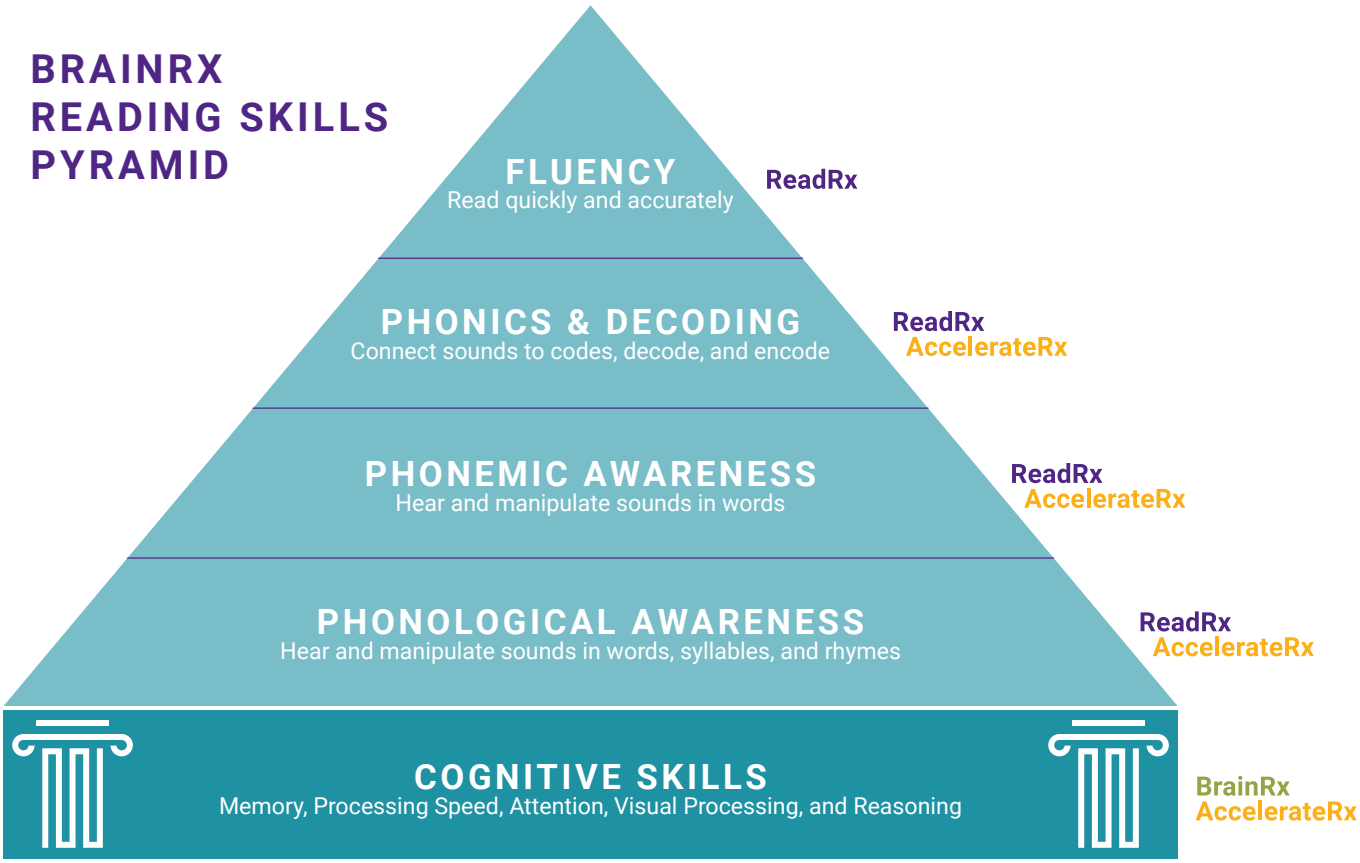
Brain training exercises must be progressively loaded. Loading incorporates multitasking and is a fast-track way to take a new skill and make it a more automatic skill.

Brain training, to be effective, requires immediate, accurate feedback. Instant, effective reinforcement and adjustments keep training focused and intense.

BRAINRX AND THE SCIENCE OF READING

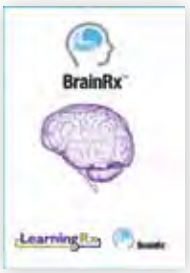
Our reading program is a multi-sensory, structured literacy program delivered through a brain training approach. According to the Science of Reading, a structured literacy approach to reading instruction is aligned with what we know about how the brain learns to read. Structured literacy programs include explicit, systematic teaching that focuses on phonological awareness, word recognition, phonics and decoding, spelling, and syntax at the sentence and paragraph levels. What sets our program apart from all other structured literacy and reading interventions is the focus on building strong cognitive skills first because they are the foundation for all learning.

Based on the Science of Reading and the Cattell-Horn-Carrol Theory of Cognition, our reading program includes explicit and systematic instruction in phonological awareness, phonics, fluency, vocabulary, and comprehension. To our knowledge, we are the only reading program that trains phonemic awareness and phonics along with memory, processing speed, visual processing, attention, and reasoning skills.



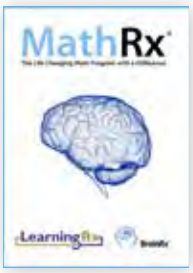
The BrainRx Reading Skills Pyramid illustrates how we place training cognitive skills as the foundation for our reading program. Our emphasis on training core cognitive skills before focusing on reading skills demonstrates our understanding of the way the brain learns to read, and the skills needed to achieve fluency and understanding when reading.

PROFILE OF PROGRAMS



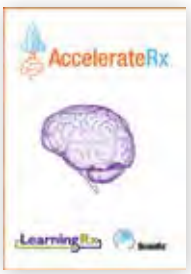
Years: 2010–2022
 # Clients: 10,151
Age of Clients: 4–95
 # Training hours: 90

BrainRx is the foundational one-on-one cognitive training program for clients ages six to adult. BrainRx includes the training procedures that target all major cognitive skills, including attention, memory, processing speed, auditory and visual processing, and logic & reasoning.



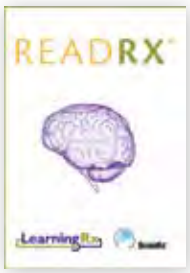
Years: 2010–2022
% of Clients: 14%
 # Clients: 3,982
Age of Clients: 5–78
 # Training hours: 120

MathRx is an intensive math intervention for clients from fourth grade to adult. MathRx includes all 28 ThinkRx training procedures and adds an additional 60 hours of training in math concepts, problem solving, reasoning, and calculations designed to increase mathematical fluency.



Years: 2010–2022
 # Clients: 1,787
Age of Clients: 4–73
 # Training hours: 60

AccelerateRx is a reading readiness and cognitive skills training intervention, addressing foundational cognitive skills for learners as young as four years old.

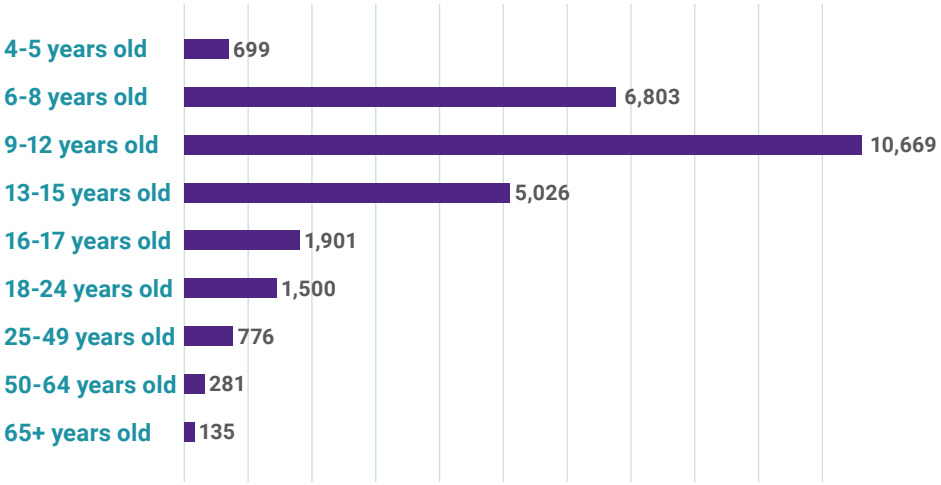


Years: 2010–2022
 # Clients: 13,264
Age of Clients: 4–83
 # Training hours: 120

ReadRx is an intensive sound-to-code reading and spelling intervention for clients ages six to adult. ReadRx includes all the training procedures and adds an additional 60 hours of training in auditory processing along with basic and complex code reading training to increase reading and spelling fluency.

PROFILE OF OUR CLIENTS

NUMBER OF CLIENTS IN EACH AGE GROUP



PERCENTAGE OF CHILDREN AND ADULTS TRAINED	
Children (Ages 4-17)	90%
Adults (Ages 18-95)	10%

PERCENTAGE WITH A PRIOR DIAGNOSIS	
Attention Deficit Hyperactivity Disorder (ADHD)	30%
Dyslexia	12%
Learning Disability	12%
Speech/Language Delay	11%
Autism Spectrum Disorder	5%
Traumatic Brain Injury	2%
Age-Related Cognitive Decline	1%

OUR RESEARCH

CHILDREN

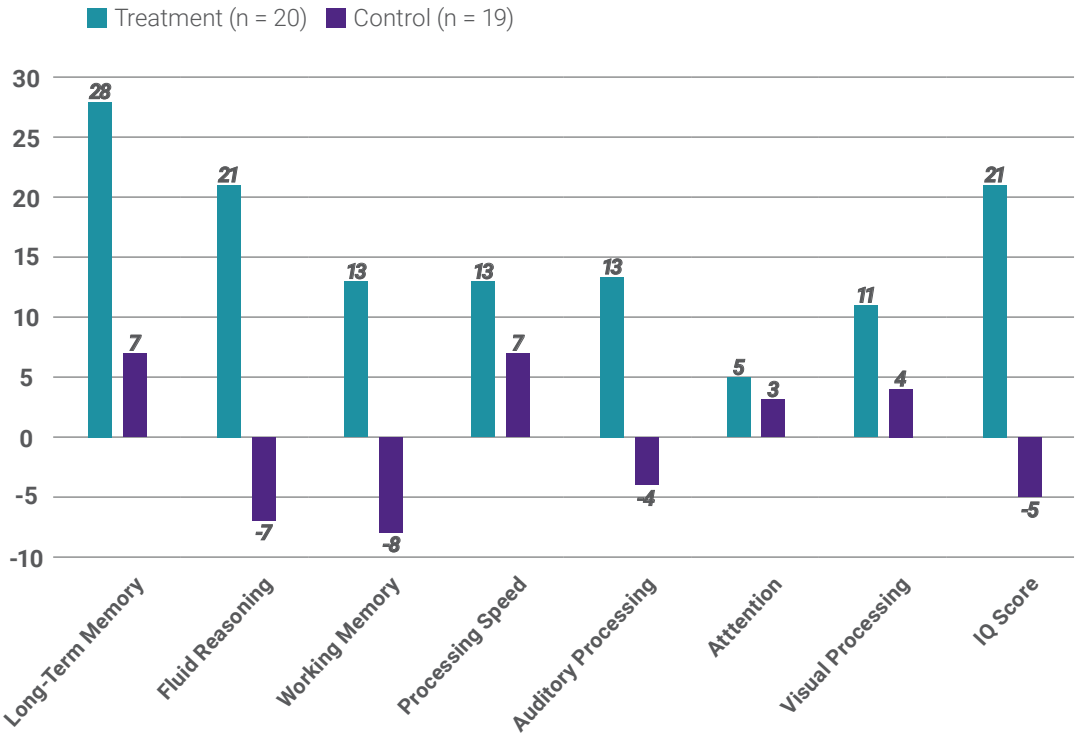
CHILDREN AGES 8–14 LEARNING STRUGGLES

Published in *Applied Cognitive Psychology*

BRAINRX COGNITIVE TRAINING EFFECTS IN CHILDREN AGES 8–14: A RANDOMIZED CONTROLLED TRIAL

- BrainRx improves cognitive skills and IQ score for children and adolescents with learning struggles
- Randomized controlled trial led by Dick Carpenter, PhD of University of Colorado-Colorado Springs and Christina Ledbetter, PhD of LSU Health Science Center compared the effects of 60 hours of BrainRx cognitive training to a waitlist control group using the Woodcock-Johnson III Tests of Cognitive Abilities and the NIH Toolbox Cognition Battery (attention only).
- IQ score of BrainRx group increased by 21 points
- BrainRx group outperformed the control group on all measures. Differences were statistically significant except for the attention measure.

CHANGE IN WJ STANDARD SCORES



BrainRx®

Source: Carpenter, D., Ledbetter, C., & Moore, A.L. (2016). LearningRx cognitive training effects in children ages 8–14: A randomized controlled trial. *Applied Cognitive Psychology, 30*(5), 815-826. doi: 10.1002/acp.3257. Available at http://onlinelibrary.wiley.com/doi/10.1002/acp.3257/epdf

CHILDREN

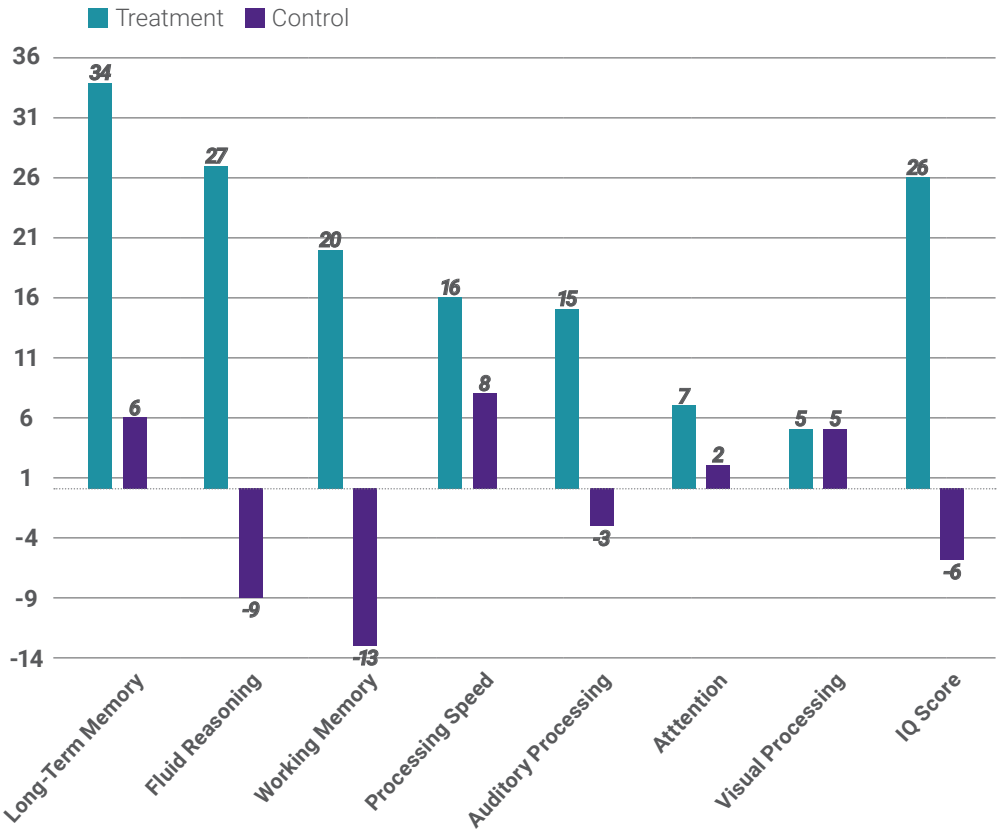
CHILDREN AGES 8–14
ADHD

Published in *Neuropsychiatric Disease and Treatment*

CLINICIAN-DELIVERED COGNITIVE TRAINING FOR CHILDREN WITH ATTENTION PROBLEMS: EFFECTS ON COGNITION AND BEHAVIOR FROM THE BRAINRX RANDOMIZED CONTROLLED TRIAL

- BrainRx improves cognitive skills, IQ score, and cooperative behavior for children and adolescents with ADHD and attention problems
- Randomized controlled trial led by Dick Carpenter, PhD of University of Colorado-Colorado Springs and Christina Ledbetter, PhD of LSU Health compared the effects of 60 hours of BrainRx cognitive training to a treatment-as-usual control group
- Results showed statistically significant differences between groups on 5 outcome measures
- IQ score of BrainRx group increased by 26 points
- All BrainRx group members obtained clinically significant change indicating overall recovery
- BrainRx group reported transfer to improved confidence, cooperative behaviors, and self-discipline.

CHANGE IN WJ & NIH TOOLBOX STANDARD SCORES



Source: Moore, A.L., Carpenter, D.M., Ledbetter, C., & Miller, T.M. (2018). Clinician-delivered cognitive training for children with attention problems: Transfer effects on cognitive and behavior from the ThinkRx randomized controlled trial. *Neuropsychiatric Disease and Treatment, 14,* 1671-1683. doi: 10.2147/NDT.S165418 Retrieved from www.ncbi.nlm.nih.gov/pmc/articles/PMC6027847

BrainRx®

CHILDREN

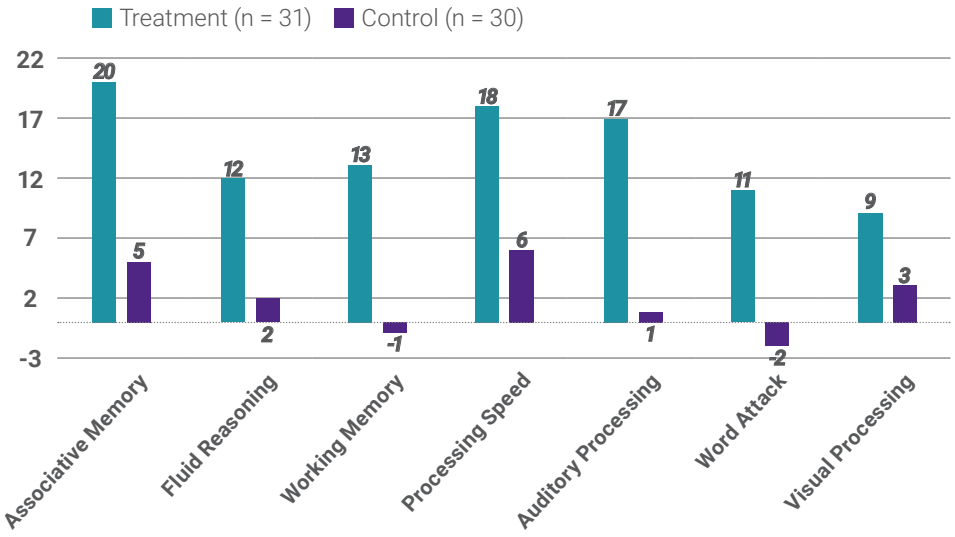
CHILDREN AGES 6–18 LEARNING STRUGGLES

Published in *Vision Development & Rehabilitation*

TRAINING THE BRAIN TO LEARN: BEYOND VISION THERAPY

- BrainRx improved cognitive skills and basic reading skills for children and adolescents with learning struggles
- Controlled trial led by Dick Carpenter, PhD of University of Colorado-Colorado Springs
- Compared the effects of 24 weeks of BrainRx/ReadRx cognitive training to a propensity-matched control group as measured by the Woodcock-Johnson III.
- The BrainRx group outperformed the control group on all 7 measures. Differences were statistically significant except for visual processing.

CHANGE IN STANDARD SCORES



BrainRx®

Source: Gibson, K., Carpenter, D.M., Moore, A.L., & Mitchell, T. (2015). Training the brain to learn: Beyond vision therapy. *Vision Development and Rehabilitation, 1*(2), 120-129. Retrieved from www.covd.org/page/VDR_1_2

CHILDREN

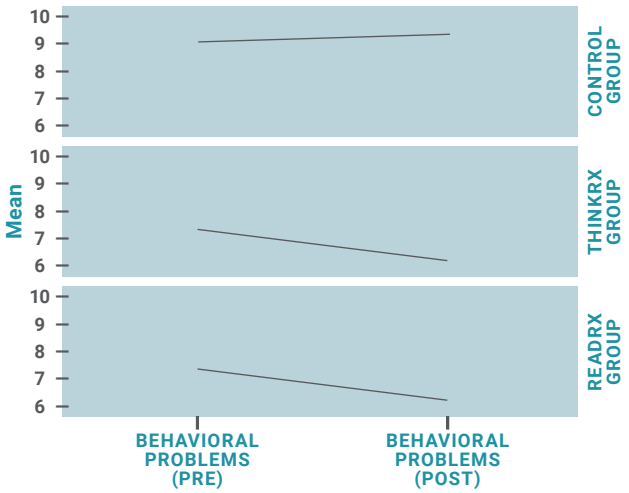
CHILDREN AGES 5–18 LEARNING STRUGGLES

Published in *Frontiers in Education*

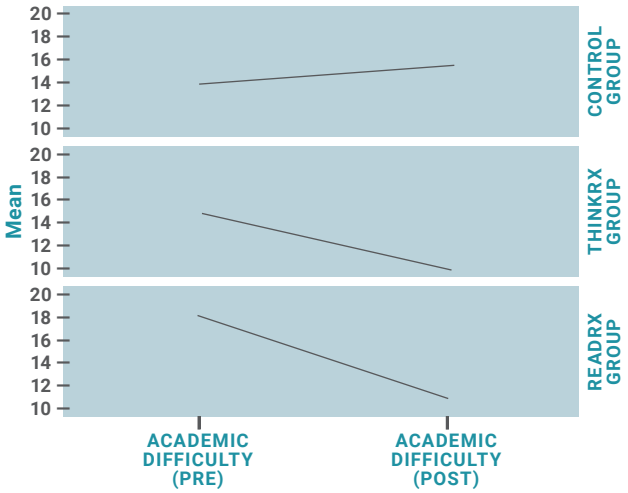
COGNITIVE TRAINING FOR CHILDREN & ADOLESCENTS AGES 5–18: EFFECTS ON ACADEMIC SKILLS, BEHAVIOR, & COGNITION

- BrainRx improved parent-reported academic struggles and oppositional behavior for children and adolescents.
- Controlled trial led by Edward Jedlicka, PhD of Lakeland University compared changes in parent-reported academic difficulty and oppositional behavior between a BrainRx group (n = 67), a ReadRx group (n = 53), and a no-contact control group (n = 58) using the Learning Skills Rating Scale.
- Both groups outperformed the control group on reduction in parent-reported academic difficulty and oppositional behavior ratings; and had significantly improved cognitive skills as well.

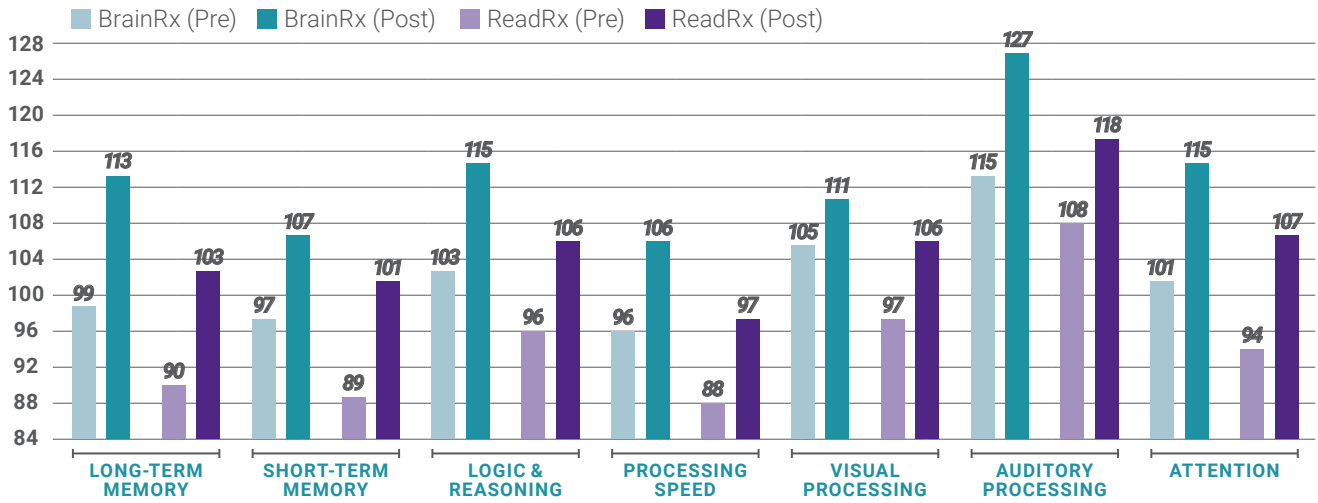
Change in Oppositional Behavior



Change in Academic Difficulty



COGNITIVE TEST SCORES



Source: Jedlicka, E. (2017). LearningRx cognitive training for children and adolescents ages 5-18: Effects on academic skills, behavior, and cognition. *Frontiers in Education, 2*(62). doi: 10.3389/feduc.2017.00062. frontiersin.org/articles/10.3389/feduc.2017.00062/full

BrainRx®

ADULTS

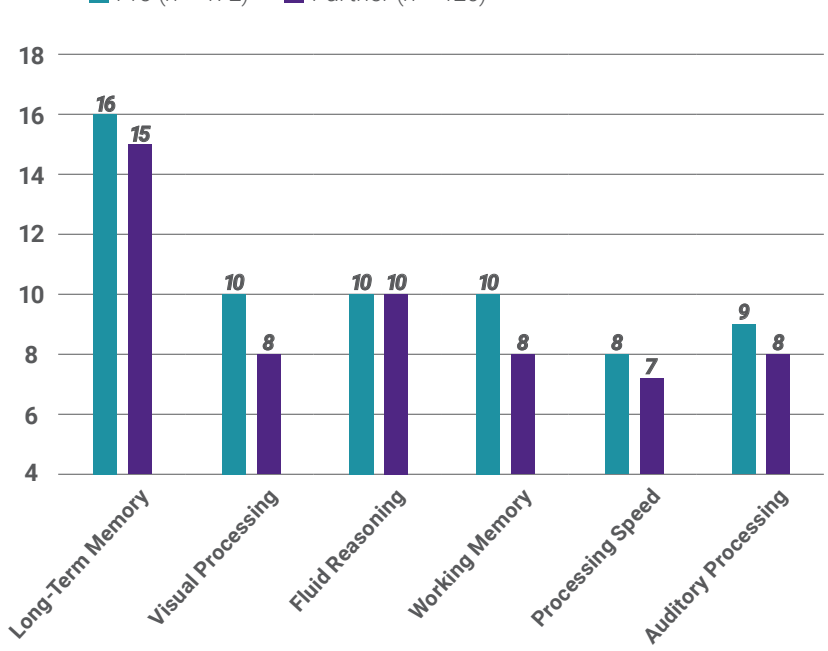
ADULTS OVER AGE 50
MEMORY

Published in *Psychology and Neuroscience*

THINKRX COGNITIVE TRAINING FOR ADULTS OVER AGE 50: CLINICIAN CAREGIVER PARTNERS IN DELIVERY AS EFFECTIVE AS CLINICIAN-ONLY DELIVERY

- BrainRx improved cognition and life skills for adults over age 50 with memory and attention complaints
- Two-group study led by Dick Carpenter, PhD of UCCS and Amy Lawson Moore, PhD of Gibson Institute of Cognitive Research to compare the cognitive and transfer effects from two methods of delivering 78 hours of training to adults over age 50 with subjective memory and attention problems (n = 292): clinician-only delivery versus a combination of clinician/home partner delivery.
- Participants in both groups improved significantly on all six measures and reported transfer to real-life improvements. Differences between methods of delivery were small, but clinician-only delivery overall led to greater cognitive gains.

CHANGE IN WJ STANDARD SCORES



BrainRx®

Source: Moore, A.L., Carpenter, D.M., Miller, T.M., & Ledbetter, C., (2019). ThinkRx Cognitive Training for Adults over Age 50: Clinician-Caregiver Partners in Delivery as Effective as Clinician-Only Delivery. *Psychology and Neuroscience, 12*(2), 291-306. . doi: 10.1037/pne0000162

ADULTS

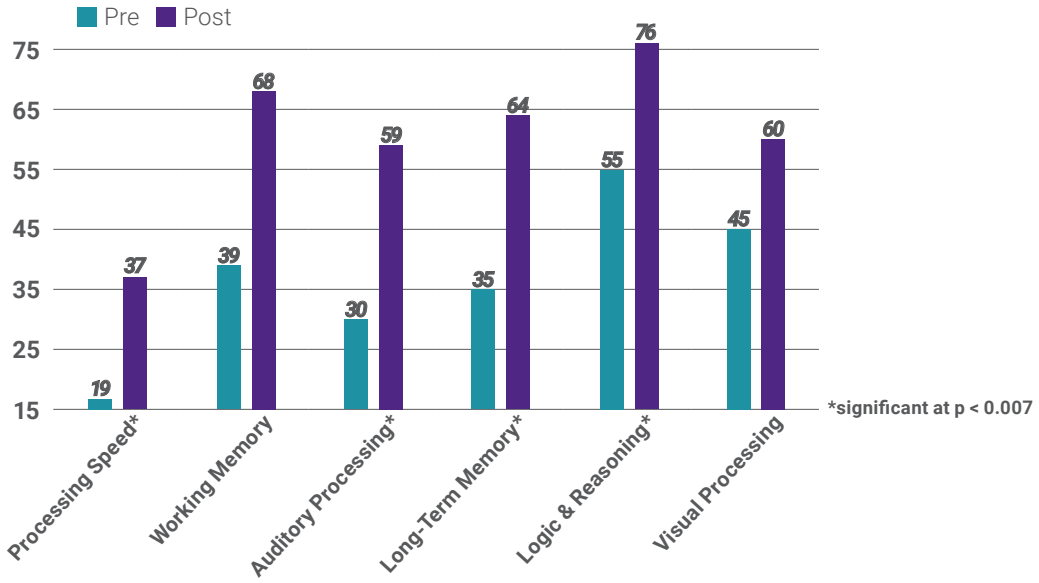
ADULTS AGES 25–46
TRAUMATIC BRAIN INJURY

Published in *Frontiers in Psychology*

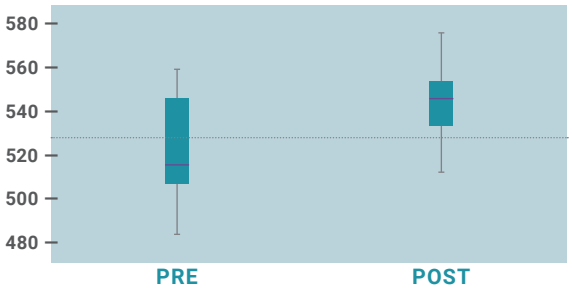
COGNITIVE EFFECTS OF BRAINRX COGNITIVE REHABILITATION TRAINING FOR ELEVEN SOLDIERS WITH BRAIN INJURY: A RETROSPECTIVE CHART REVIEW

- Cognition and life skills in soldiers recovering from brain injury improved after BrainRx
- Pilot study led by Christina Ledbetter, PhD, of LSU examining outcomes from 80 hours of BrainRx supplemented with Brainskills for eleven soldiers in a warrior transition unit
- 10 of 11 soldiers achieved overall recovery based on clinically-significant changes in general intellectual ability which increased an average of 13 points
- Soldiers reported transfer to real-life improvements including increased confidence and perseverance, improved attention, and improved memory.
- Soldiers also reported returning to school and work and a higher tolerance for frustration

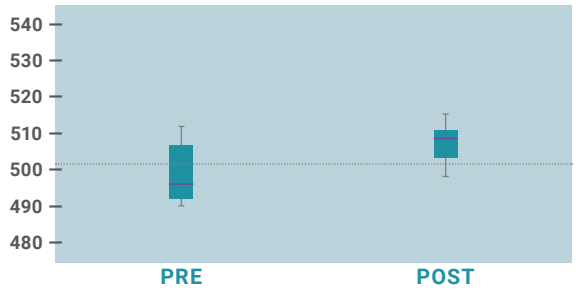
PRE AND POST PERCENTILES ON WJIII



CLINICAL CHANGE IN WORKING MEMORY



CLINICAL CHANGE IN ASSOCIATIVE MEMORY



Source: Ledbetter, C., Moore, A.L., Mitchell, T. (2017). Cognitive effects of ThinkRx cognitive rehabilitation training for eleven soldiers with brain injury: A retrospective chart revie w. *Frontiers in Psychology, 8*(825). doi: 10.3389/fpsyg.2017.00825 http://journal.frontiersin.org/article/10.3389/fpsyg.2017.00825/full

BrainRx®

CHILDREN & ADULTS

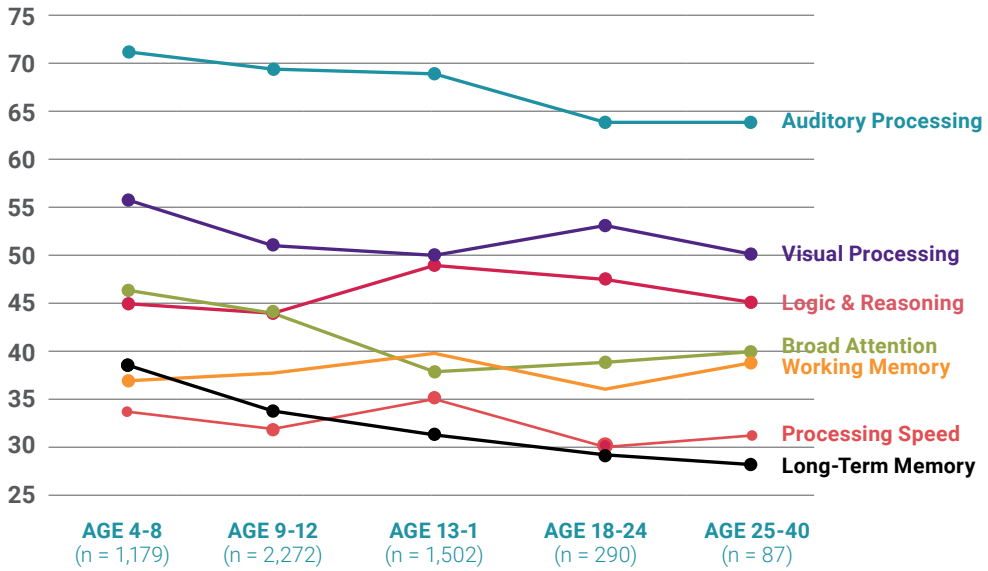
CHILDREN & ADULTS
ADHD

Published in *Journal of Mental Health & Clinical Psychology*

THE PROMISE OF CLINICIAN-DELIVERED COGNITIVE TRAINING FOR CHILDREN DIAGNOSED WITH ADHD

- Interventions for ADHD need to target more than attention, because working memory, long-term memory, and processing speed are also deficient in ADHD.
- In a review of interventions for ADHD, Christina Ledbetter, PhD of LSU, and Amy Lawson Moore, PhD of Gibson Institute, share their cross-sectional study of more than 5,000 scores on the Woodcock Johnson III - Tests of Cognitive Abilities (WJ III) administered to children and adults previously diagnosed with ADHD (n = 5,416).
- Across the lifespan, the greatest cognitive deficits in clients with ADHD were working memory, long-term memory, and processing speed.
- Sustained attention was the fourth weakest out of seven skills measured. The strongest skills were auditory and visual processing.

TRAJECTORY OF COGNITIVE SKILLS PERCENTILES FROM AGE 4 TO 40 IN ADHD



BrainRx®

Source: Moore, A.L., & Ledbetter, C. (2019). The Promise of Clinician-Delivered Cognitive Training for Children Diagnosed with ADHD. *Journal of Mental Health and Clinical Psychology, 3*(3), 3-8. doi: 10.29245/2578-2959/2019/3.1180 Available at mentalhealthjournal.org/articles/the-promise-of-cliniciandelivered-cognitive-training-for-children-diagnosed-with-adhd.pdf

HIGH SCHOOL STUDENTS

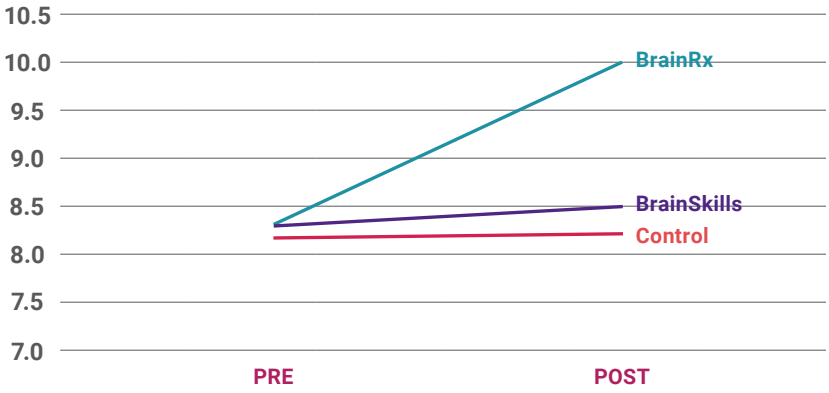
HIGH SCHOOL STUDENTS
AT-RISK

Published in *Journal of Experimental Education*

THE EFFICACY OF THE BRAINRX COGNITIVE TRAINING PROGRAM: MODALITY AND TRANSFER EFFECTS

- BrainRx improves memory and reasoning skills in at-risk high school students
- Three million dollar NSF-funded randomized controlled trial led by Oliver Hill, PhD of Virginia State University compared outcomes on tests of memory, reasoning, and math attitudes between BrainRx one-on-one training, Brainskills (digital BrainRx program), and homework assistance for 225 at-risk high school students
- Significant differences between groups were found on measures of fluid reasoning and long-term memory
- Training gains transferred to improved attitudes about math for the Brainskills group

CHANGE IN FLUID REASONING SCORES



Source: Hill, O.W., Zewelanji, S., & Faison, O. (2015). The Efficacy of the LearningRx Cognitive Training Program: Modality and Transfer Effects. *Journal of Experimental Education: Learning, Instruction, and Cognition, 1-21.* doi: 10.1080/00220973.2015.1065218

TEENS & ADULTS

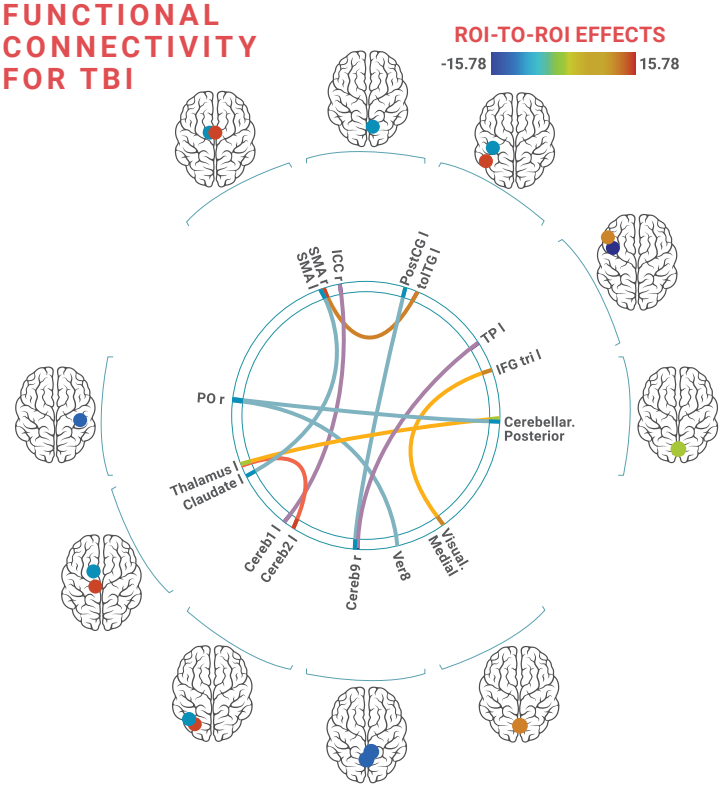
AGE 15 TO ADULT
TRAUMATIC BRAIN INJURY

Published in Frontiers in *Human Neuroscience*

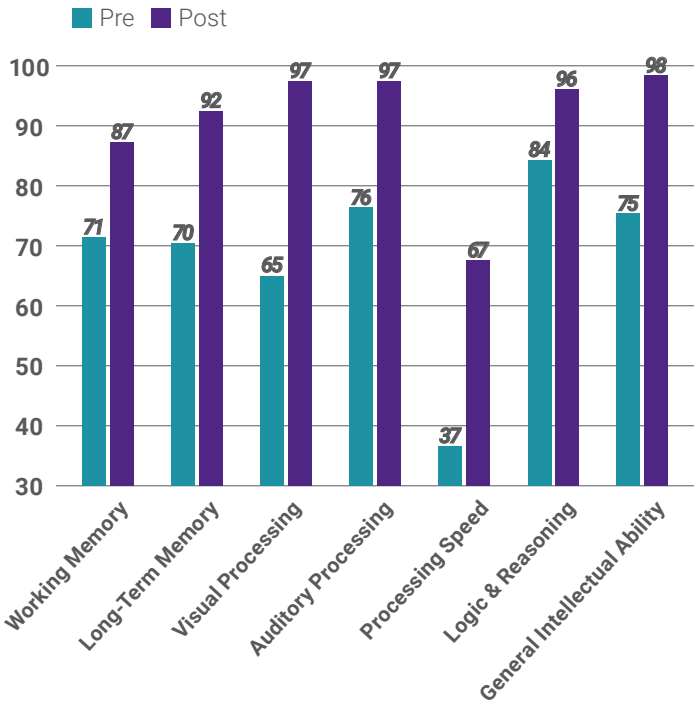
NEUROIMAGING & NEUROPSYCHOLOGICAL OUTCOMES FOLLOWING CLINICIAN-DELIVERED COGNITIVE TRAINING FOR SIX PATIENTS WITH MILD BRAIN INJURY

- In addition to neuropsychological improvements, changes in functional connectivity and brain structure were documented using MRI for clients with mild Traumatic Brain Injury following 60 hours of training with BrainRx.
- In a multiple case study led by neuroscientist Christina Ledbetter, PhD of LSU, changes on MRI and cognitive tests were examined in 6 patients with mild brain injury
- There were statistically significant improvements in long-term memory, processing speed, logic & reasoning, auditory processing, and overall IQ score; and there was clinically significant recovery for all 6 patients.
- Transfer effects to real life benefits were found in improved focus and attention, mood and outlook on life, social relationships and communication skills, work and school performance, and daily living skills like driving and managing finances.
- There were 10 significant training induced changes in functional connectivity and 3 significant changes in structural connectivity (FA) correlating with changes in IQ score.

TRAINING-INDUCED FUNCTIONAL CONNECTIVITY FOR TBI



PRE/POST PERCENTILES ON WJIV



BrainRx®

Source: Moore, A.L., Carpenter, D., James, R.L., Miller, T.M., Moore, J.J., Disbrow, E., & Ledbetter, C. (2020). Neuroimaging and neuropsychological outcomes following clinician-delivered cognitive training for six patients with mild brain injury: A multiple case study. *Frontiers in Human Neuroscience, 14*:229, 1-15. www.frontiersin.org/articles/10.3389/fnhum.2020.00229/full

SENIORS

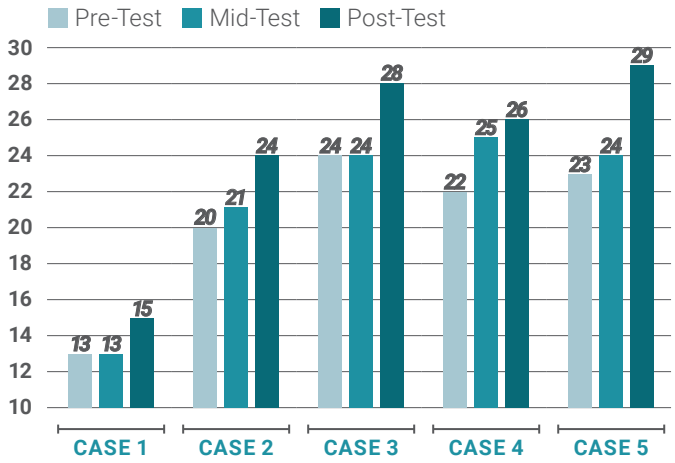
SENIORS
COGNITIVE IMPAIRMENT

Published in *OBM Integrative & Complementary Medicine*

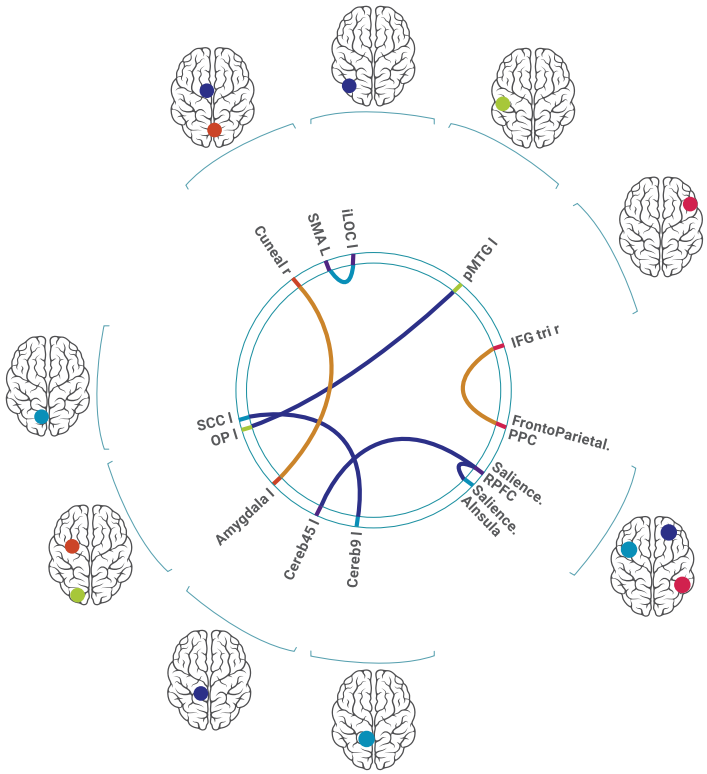
MRI AND NEUROPSYCHOLOGICAL OUTCOMES FOLLOWING A FUNCTIONAL MEDICINE INTERVENTION WITH COGNITIVE TRAINING IN MILD COGNITIVE IMPAIRMENT (MCI): A MULTIPLE CASE STUDY

- Aging adults with MCI had improved cognitive test scores and quality of life following a multidisciplinary intervention with cognitive training.
- In a multiple case study led by Randolph James, MD of True Life Medicine and neuroscientist Christina Ledbetter, PhD of LSU, five senior clients with various levels of cognitive decline completed 90 hours of cognitive training coupled with a functional medicine protocol including a Paleo diet, aerobic exercise, sleep optimization, stress management, and nutritional supplementation.
- In all five cases, improvement in both cognitive and life skills was achieved. Four of the five cases were no longer classified as MCI by the Montreal Cognitive Assessment (MoCA) at post-testing.. The cutoff for MCI is 23.
- Functional MRI analyses showed changes in connectivity correlated significantly with change on cognitive testing measures (MoCA & DRS-2).

CHANGE ON MONTREAL COGNITIVE ASSESSMENT (MoCA)



CORRELATION BETWEEN FUNCTIONAL CONNECTIVITY AND CHANGES IN MoCA TEST SCORES



Source: James, R., Moore, A.L., Carpenter, D., Miller, T., & Ledbetter, C. (2019). Feasibility of a Functional Medicine Approach to Slowing Clinical Cognitive Decline in Patients Over Age 55: A Multiple Case Study Report. *OBM Integrative and Complementary Medicine, 4*(3). doi: 10.21926/obm.icm.1903054 Available at https://dx.doi.org/10.21926/obm.icm.1903054

BrainRx®

CHILDREN & ADULTS

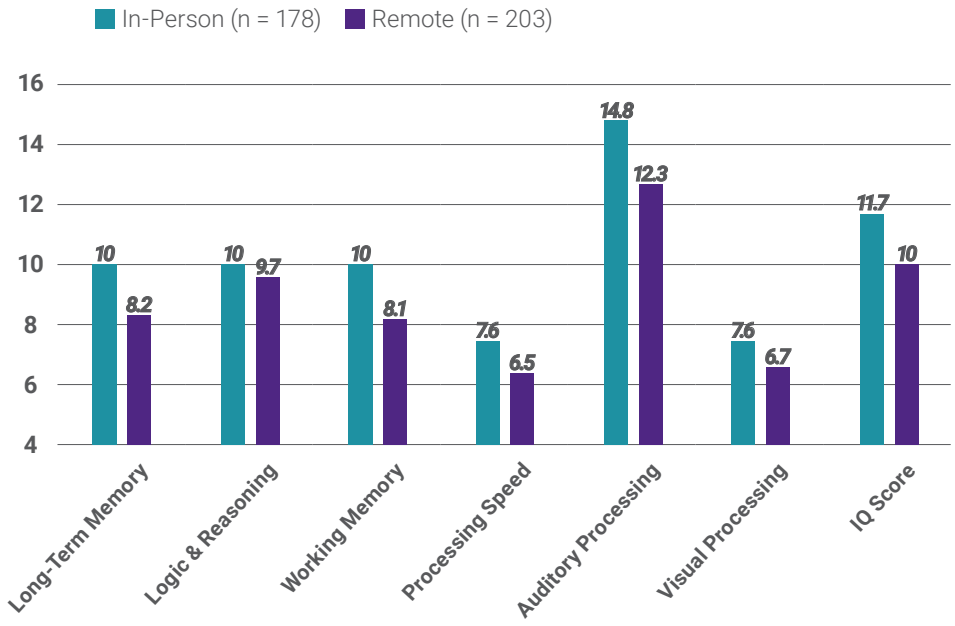
CHILDREN & ADULTS

Published in
Frontiers in Psychology

REMOTE VS. IN-PERSON DELIVERY OF BRAINRX COGNITIVE TRAINING DURING THE COVID-19 PANDEMIC: A NON-INFERIORITY STUDY

- Remote delivery of brain training via Zoom is a viable alternative to in-person delivery.
- In a two-group comparison study led by neuroscientist Christina Ledbetter, PhD of LSU and Amy Lawson Moore, PhD of Gibson Institute of Cognitive Research, cognitive and real-life outcomes of 178 clients who completed brain training in-person were compared to the outcomes of 203 clients who completed brain training via Zoom.
- There were no statistically significant differences on any of the outcomes measured. The in-person group had slightly higher gains on all cognitive tests.
- Transfer effects to real life benefits were found for both groups in improved memory, reasoning, processing, attention, math, reading, writing skills, grades and academic performance, confidence, personal responsibility, social skills, mood, and outlook.

CHANGE IN WJ IV STANDARD SCORES



BrainRx®

Source: Moore, A.L., Miller, T.M., & Ledbetter, C. (2021). Remote vs. In-Person Delivery of LearningRx One-on-One Cognitive Training During the COVID-19 Pandemic: A Non-inferiority Study. *Frontiers in Psychology, 12*, 749898. doi: 10.3389/fpsyg.2021.749898

CHILDREN

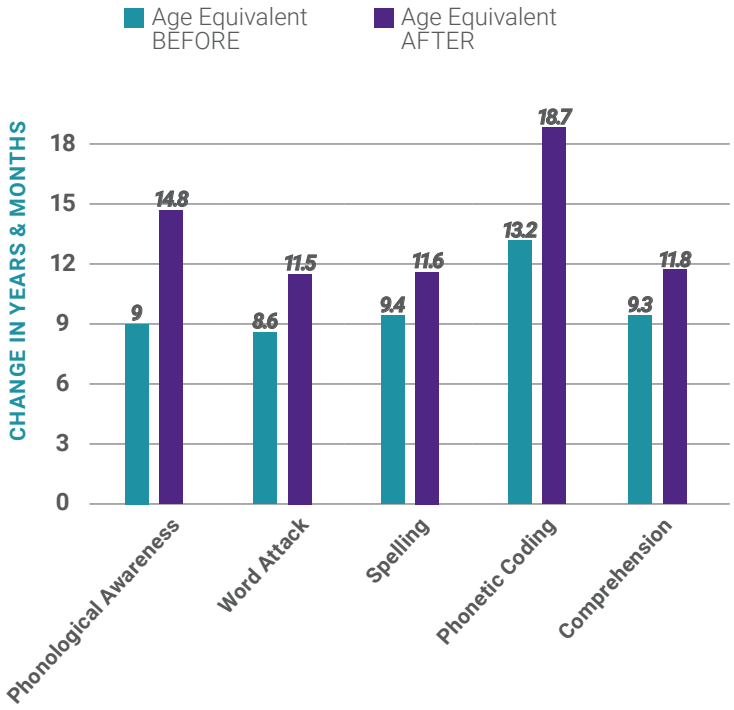
CHILDREN 5-17
ADHD & READING

Published in *Psychology Research & Behavior Management*

READRX® FOR STRUGGLING READERS WITH AND WITHOUT ATTENTION PROBLEMS

- Struggling readers with and without ADHD achieved significant gains in reading skills and cognitive skills after 24 weeks of ReadRx.
- In a real-world data study led by neuroscientist Christina Ledbetter, PhD of LSU and Amy Lawson Moore, PhD of Gibson Institute of Cognitive Research, outcomes in reading, cognition, and real-life change of 3,527 students ages 5-17 who completed ReadRx were evaluated. Outcomes between struggling readers with and without ADHD were also compared.
- There were statistically significant changes on all reading and cognitive measures for both types of struggling readers. Having a diagnosis of ADHD was not a significant predictor of reading or cognitive outcomes.
- Transfer effects to real life benefits were found for both groups in confidence, persistence & effort, self-discipline, academic performance in reading, spelling, & comprehension, and overall cognition.

CHANGE IN AGE-EQUIVALENT SCORES



Source: Moore, A.L., Miller, T.M., Moore, J.J., Ledbetter, C. (2023). A Real-World Data Study on the Impact of the ReadRx Cognitive Training and Reading Intervention on Cognition, Basic Reading Ability, and Psychosocial Skills for 3527 Children. *Psychology Research and Behavior Management,16*,1195-1220. https://doi.org/10.2147/PRBM.S397665

BrainRx®

CHILDREN & ADULTS

CHILDREN & ADULTS
ASSESSMENT

Published in *Psychology Research and Behavior Management*

RELIABILITY AND VALIDITY OF THE REVISED GIBSON TEST OF COGNITIVE SKILLS, A COMPUTER-BASED TEST BATTERY FOR ASSESSING COGNITION ACROSS THE LIFESPAN

- The Gibson Test of Cognitive Skills (Version 2) is correlated with the Woodcock Johnson III as a valid and reliable method for assessing cognitive skills in children and adults
- Using a nationwide sample of 2,737 people ages 5 to 85, Amy Lawson Moore, PhD and Terissa Miller, MS Psy of Gibson Institute examined evidence of validity and reliability of the Gibson Test in measuring short-term memory, long-term memory, processing speed, logic and reasoning, visual processing, auditory processing, and Word Attack skills.
- Strong evidence of reliability included test-retest reliability coefficients ranging from 0.69 to 0.91 and split-half reliability coefficients ranging from .87 to .91. Strong evidence of validity included concurrent validity with the Woodcock Johnson III with coefficients ranging from 0.53 to 0.93.
- Compared to 7 major digital cognitive tests, the GT is the only one that measures auditory processing (including blending, segmenting, and dropping) and Word Attack skills. It has the second largest normative database among the available digital cognitive tests, and the largest one that includes children.

COMPARISON TO SEVEN MAJOR DIGITAL COGNITIVE TESTS

Digital Cognitive Test	Working Memory	Long-Term Memory	Visual Processing	Processing Speed	Logic & Reasoning	Auditory Processing	Word Attack	Norming Sample	Norm Group Ages
Gibson Test of Cognitive Skills -V2	x	x	x	x	x	x	x	2,737	5-85 years
NeuroTrax	x	x	x	x	x			1,569	8-120 years
MicroCog	x		x	x	x			810	18-89 years
ImPACT	x			x				931	13-college
CNS Vital Signs	x	x	x	x				1,069	7-90 years
Computer-Administered Neuro-psychological Screen (CANS-MCI)	x			x				310	51-93 years
Automated Neuro-psychological Assessment Metrics (ANAM)	x	x	x	x	x			107,801	17-65 years
Cambridge Neuro-psychological Test Automated Battery (CANTAB)	x		x	x	x			2,000	4-90 years

BrainRx®

Source: Moore, A.L., & Miller, T. (2018). Reliability and validity of the revised Gibson Test of Cognitive Skills, a computer-based test battery for assessing cognition across the lifespan. *Psychology Research and Behavior Management, 11*, 25–35. doi:10.2147/PRBM.S152781

CHILDREN & ADULTS

CHILDREN & ADULTS
ASSESSMENT

Published in *Psychology Research and Behavior Management*

RELIABILITY EVIDENCE FOR THE GIBSON ASSESSMENT OF COGNITIVE SKILLS (GACS):
A BRIEF TOOL FOR SCREENING COGNITIVE SKILLS ACROSS THE LIFESPAN

- The Gibson Assessment of Cognitive Skills (GACS) is a reliable brief screening tool for assessing cognitive skills in children and adults
- In a study led by cognitive psychologist Amy Lawson Moore, PhD of Gibson Institute and neuroscientist Christina Ledbetter, PhD of LSU, three sources of reliability evidence were collected for the GACS: internal consistency reliability, split-half reliability, and test-retest reliability.
- Overall coefficient alphas range from 0.80 to 0.94, producing a strong source of internal consistency reliability evidence. The split-half reliability coefficients ranged from 0.83 to 0.96 overall, producing a strong second source of reliability evidence. Across all ages, the test-retest reliability coefficients ranged from 0.83 to 0.98 indicating strong test-retest reliability and stability across administrations.

RELIABILITY EVIDENCE FOR THE GACS

Subtest	Internal *a*	Split-Half *r*	Test-Retest *r*
Working Memory	0.80	0.83	0.83
Visual Processing	0.94	0.96	0.92
Auditory Processing	0.92	0.94	0.98
Logic & Reasoning	0.81	0.83	0.92
Processing Speed	0.94	0.94	0.95
Word Attack	0.92	0.94	0.96

Source: Moore, A.L., Miller, T.M., & Ledbetter, C. (2021). Reliability Evidence for the Gibson Assessment of Cognitive Skills (GACS): A Brief Tool for Screening Cognitive Skills Across the Lifespan. *Psychology Research and Behavior Management, 14,* 31-40. https://doi.org/10.2147/PRBM.S291574

BrainRx®

HIGH SCHOOL STUDENTS

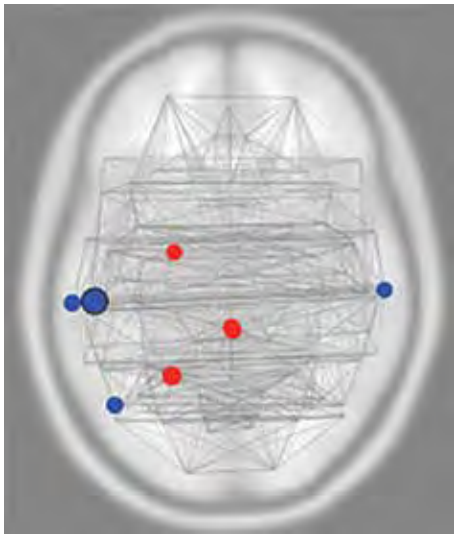
HIGH SCHOOL STUDENTS
AT-RISK

Presented at *Society for Neuroscience*

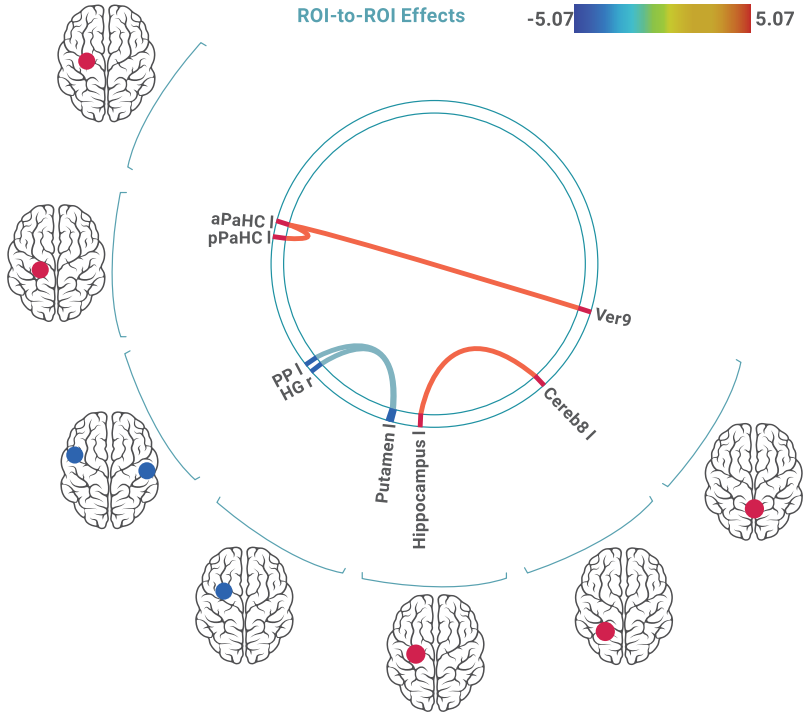
MRI STUDY: CORRELATION OF COGNITIVE TRAINING GAINS AND RESTING STATE FUNCTIONAL CONNECTIVITY

- BrainRx training changed *overall global efficiency* of the brain and increased functional connectivity between regions of the brain
- As part of a larger randomized controlled trial by Hill, Serpell, and Faison (2016), neuroscientist Christina Ledbetter, PhD, of LSU conducted pre- and post-training resting state fMRI studies on 30 of the 225 participating high school students.
- BrainRx training changed *overall global efficiency,* a measure of information exchange, for areas associated with visual processing, auditory processing, contextual associations ,the default mode network, and the cerebellum
- BrainRx training induced changes in functional connectivity, a measure of the relationship between anatomically distinct regions, for areas associated with *auditory processing contextual associations* and *memory*
- For all 7 cognitive skills measured, changes in resting state functional connections correlated with changes in performance on the tests for the treatment group

TRAINING-INDUCED GLOBAL EFFICIENCY
TREATMENT VS. CONTROL



TRAINING-INDUCED FUNCTIONAL CONNECTIVITY
TREATMENT VS. CONTROL



Source: Ledbetter, C., Faison, M., Hill, O., & Patterson, J. (2016). *Correlation of Cognitive Training Gains and Resting State Functional Connectivity.* Presented at Society for Neuroscience, San Diego, CA, November 12, 2016. www.gibsonresearchinstitute.org/wp-content/uploads/2016/11/SFNposters_CLedbetter.pdf

BrainRx®

ADULTS

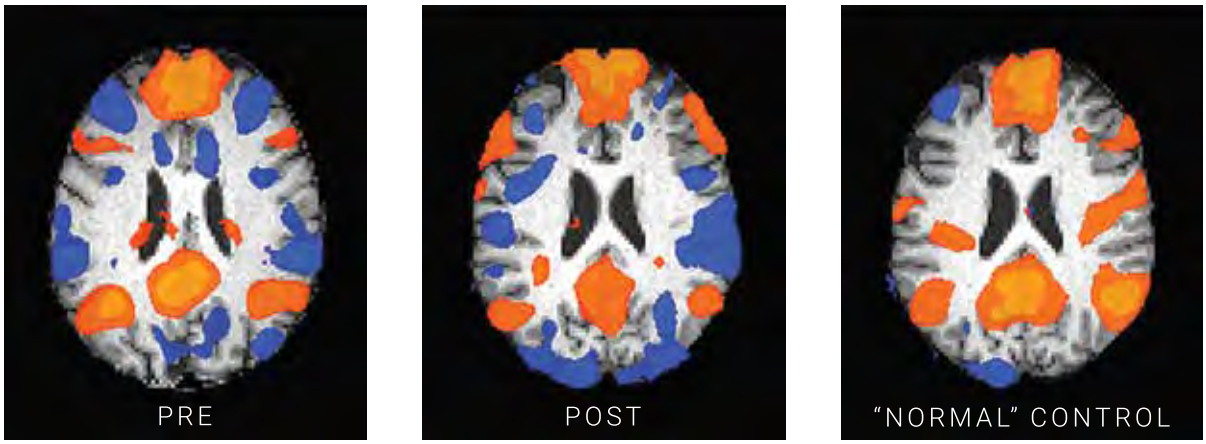
ADULTS
TRAUMATIC BRAIN INJURY

Presented at *Brain Injury Summit*

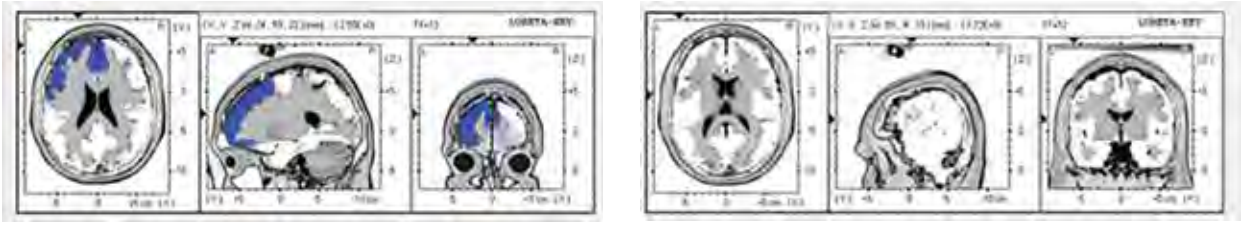
MRI, QEEG, & NEUROPSYCHOLOGICAL OUTCOMES FOLLOWING COGNITIVE REHABILITATION TRAINING FOR SEVERE TRAUMATIC BRAIN INJURY: A CLINICAL CASE STUDY

- Changes in the Default Mode Network after cognitive training can be seen on functional MRI.
- In a clinical case study of a participant who suffered a severe TBI 8 years prior, Christina Ledbetter, PhD of LSU and Amy Lawson Moore, PhD of Gibson Institute examined changes in neural connectivity using fMRI and qEEG as well as changes on standard neuropsychological tests following 60 hours of ThinkRx brain training.
- The largest cognitive gains were noted on processing speed and working memory, along with a 21-point increase in IQ score from 111 to 132. Participant returned to his former high level STEM career field, was able to stop taking Aricept for memory, and reported improved motivation and outlook on life.
- Post-training MRI showed normalization of connectivity in the Default Mode Network with restoration of anticorrelations in attention and visual areas. Post-training qEEG showed normalization of left frontal activity consistent with improvements in mood, depression, and memory.

fMRI RESULTS



qEEG RESULTS



Source: Moore, A.L., & Ledbetter, C. (2018). MRI, qEEG, & neuropsychological outcomes following cognitive rehabilitation training for severe traumatic brain injury: A clinical case study. Presented at *Brain Injury Summit*, Jan 2018, Vail, CO.

BrainRx®

CHILDREN

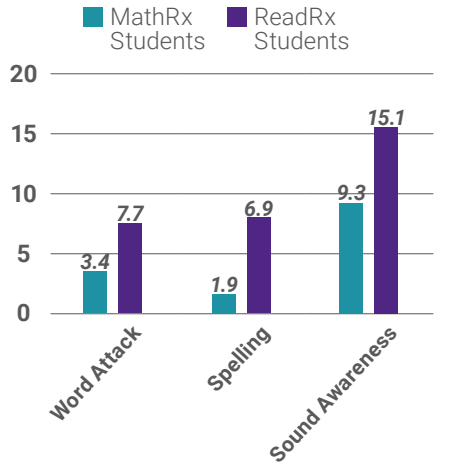
CHILDREN
MATH & READING

Technical Report

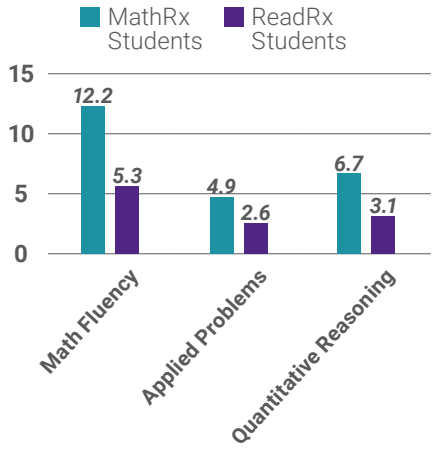
ACHIEVEMENT OUTCOMES FOR BRAINRX STUDENTS: MATH AND READING ACHIEVEMENT BEFORE AND AFTER COGNITIVE TRAINING

- Reading and math interventions at BrainRx remediated their intended target skills in a large sample of clients.
- In a controlled differential effects analysis of the results of MathRx and ReadRx outcomes, Amy Lawson Moore, PhD, of Gibson Institute of Cognitive Research compared the results in a sample of 2,096 clients who had completed either MathRx or ReadRx between 2010 and 2015 at one of our centers.
- MathRx students made nearly twice the gains on math achievement tests than ReadRx students. ReadRx students made nearly twice the gains on reading achievement tests than MathRx students. This study controlled for placebo effects in assessing reading and math outcomes.
- State reading achievement tests were also collected for 65 ReadRx graduates. Prior to training, the mean percentile for this group was 33. After training, the group had jumped to the 47th percentile in reading—average for their age. Further, 91% of students who completed the ReadRx program (59 of 65) showed improvement on state reading achievement tests after the intervention.

READING ACHIEVEMENT



MATH ACHIEVEMENT



Source: Moore, A. (2015). *Achievement Outcomes for LearningRx Students: Math and Reading Achievement Before and After Cognitive Training.* Gibson Institute of Cognitive Research. (Technical report available at LearningRx.com)

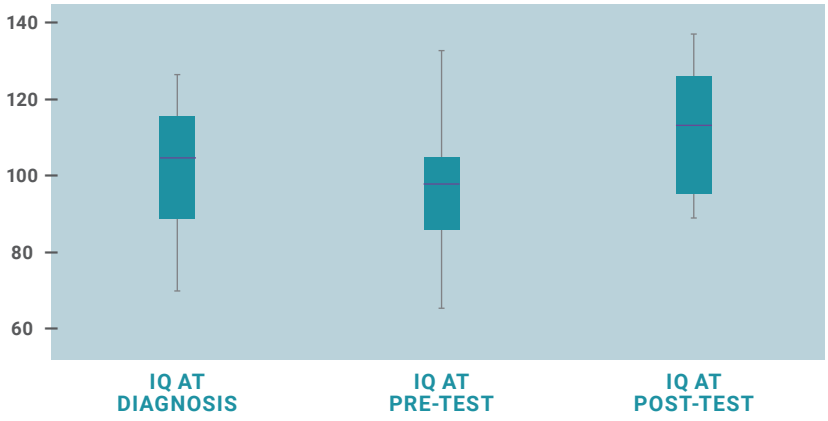
CHILDREN

CHILDREN
IQ STUDY

Technical Report

BRAINRX TRAINING AND IQ GAINS:
A DOUBLE BASELINE STUDY

- Clients who declined cognitively after their initial diagnosis while waiting to begin training improved after completing BrainRx training.
- In a double baseline study with participants serving as their own controls, Amy Lawson Moore, PhD of Gibson Institute of Cognitive Research and distinguished research scientist Howard Wainer, PhD collected diagnostic baseline IQ test results, pretraining IQ test results, and post-training IQ test results from 40 BrainRx graduates to identify trends within participants.
- After diagnosis, while waiting to begin training, there was a slight decline in average IQ score from 102 to 96. After training at BrainRx, the lost points were regained and additional significant gains were noted, averaging 112 at post-testing.



Source: Moore, A.L., & Wainer, H. (2015). *LearningRx Training and IQ Gains*. Colorado Springs, CO: Gibson Institute of Cognitive Research.(Technical report available at LearningRx.com)

BrainRx®

BrainRx Bibliography

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Visit

www.gibsonresearchinstitute.org/publications or www.learningrx.com/brain-training-research for the most up-to-date list of LearningRx research studies.

CLIENT RESULTS

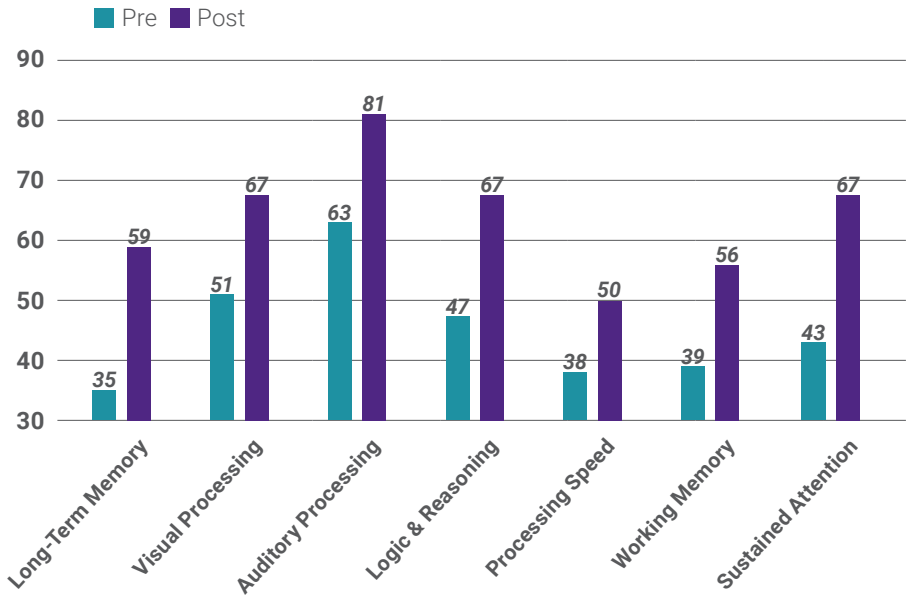
Overall Results
Change in IQ Score by Age

ALL PROGRAMS | COGNITIVE RESULTS | ALL

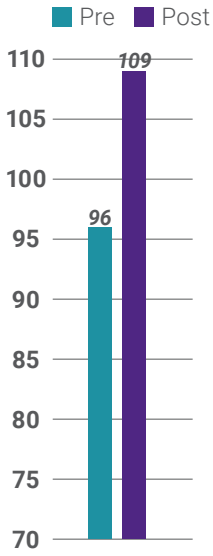
Number of Clients 27,790
Ages 4-95
Ave. Number of Training Hours 79

ALL AGES: CLIENT RESULTS

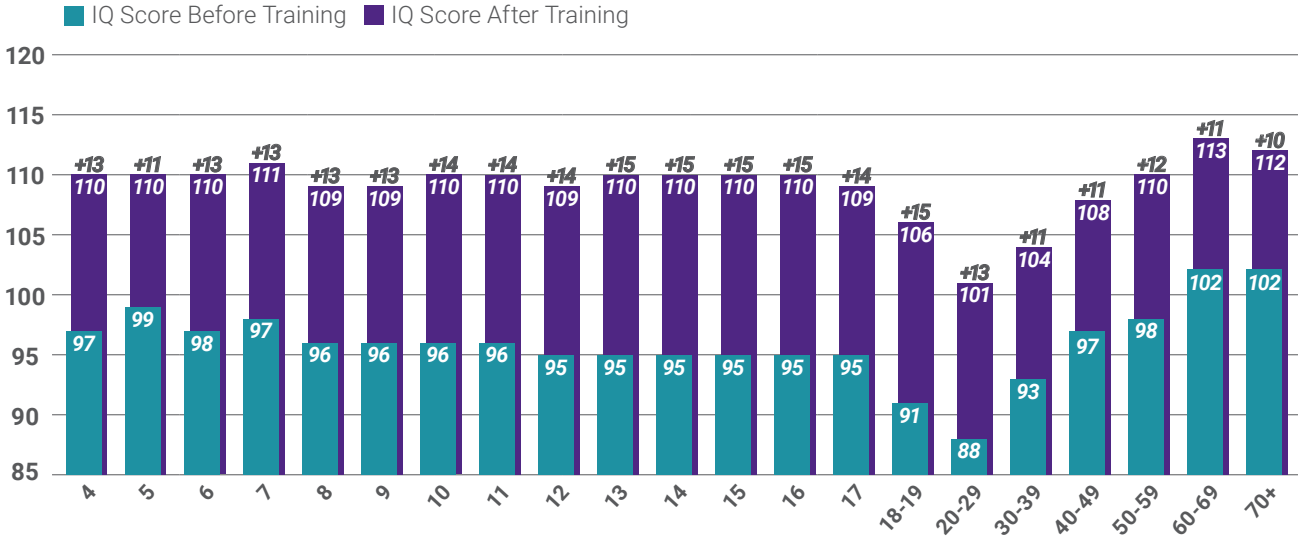
PERCENTILE CHANGE



IQ SCORE CHANGE



PRE- AND POST-TRAINING IQ SCORE BY AGE



Standard scores & percentiles are aggregated across all test batteries: Woodcock Johnson III, Woodcock Johnson IV, & Gibson Assessment of Cognitive Skills. Changes in standard scores were statistically significant at p < .001 on all measures.

BrainRx®

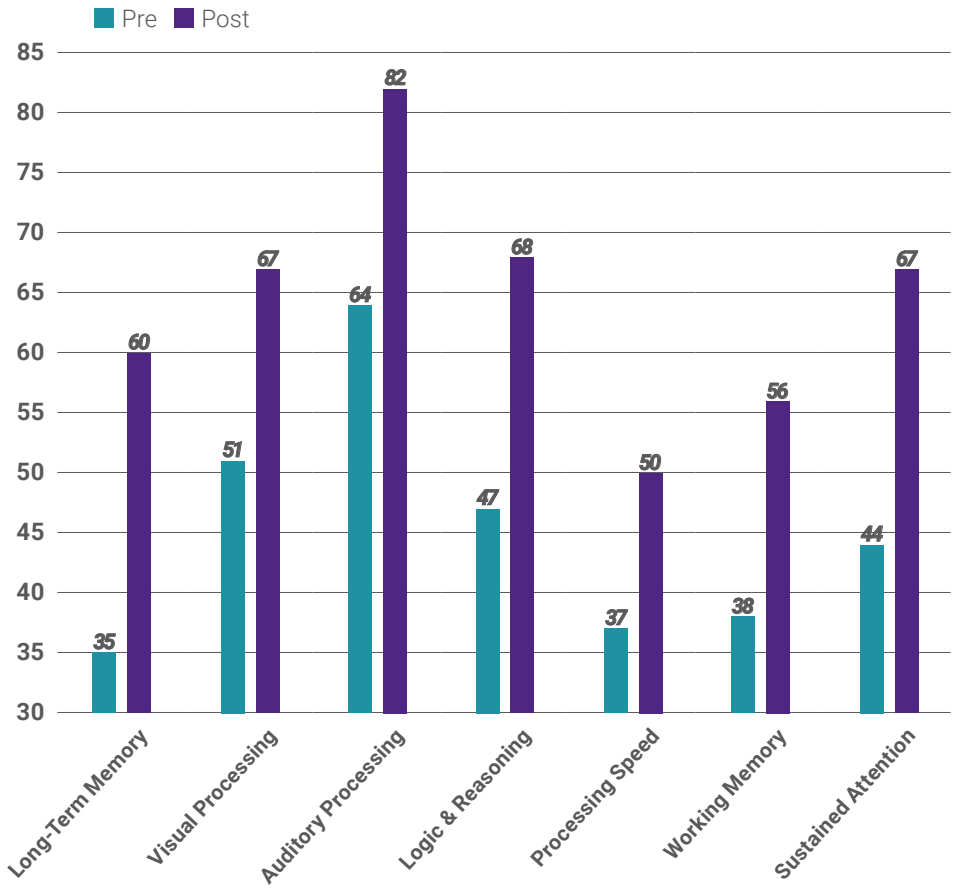
CHILDREN: RESULTS BY PROGRAM

All Programs
BrainRx
ReadRx
AccelerateRx
MathRx

ALL PROGRAMS | COGNITIVE RESULTS | CHILDREN

Number of Clients 25,098
Ages 4-17
Ave. Number of Training Hours 79

PERCENTILE CHANGE



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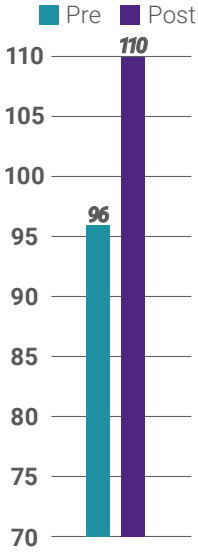

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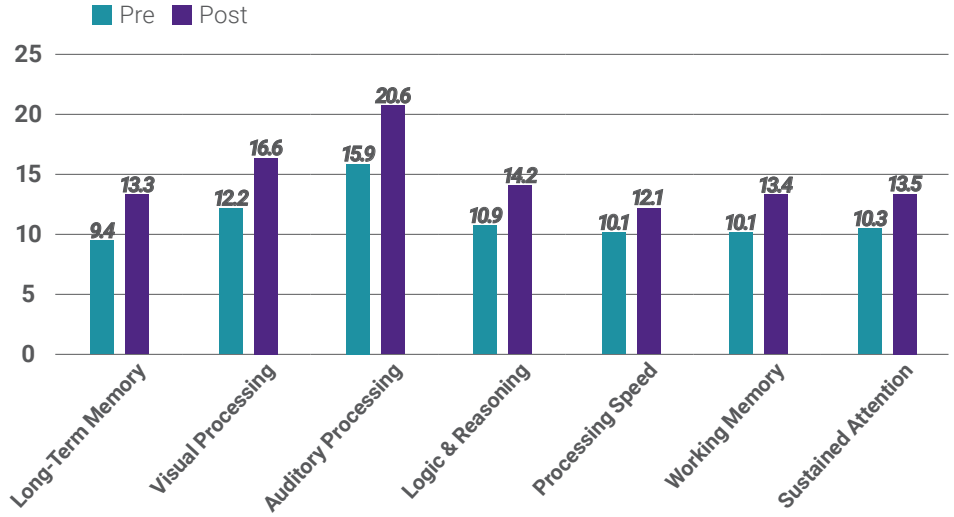


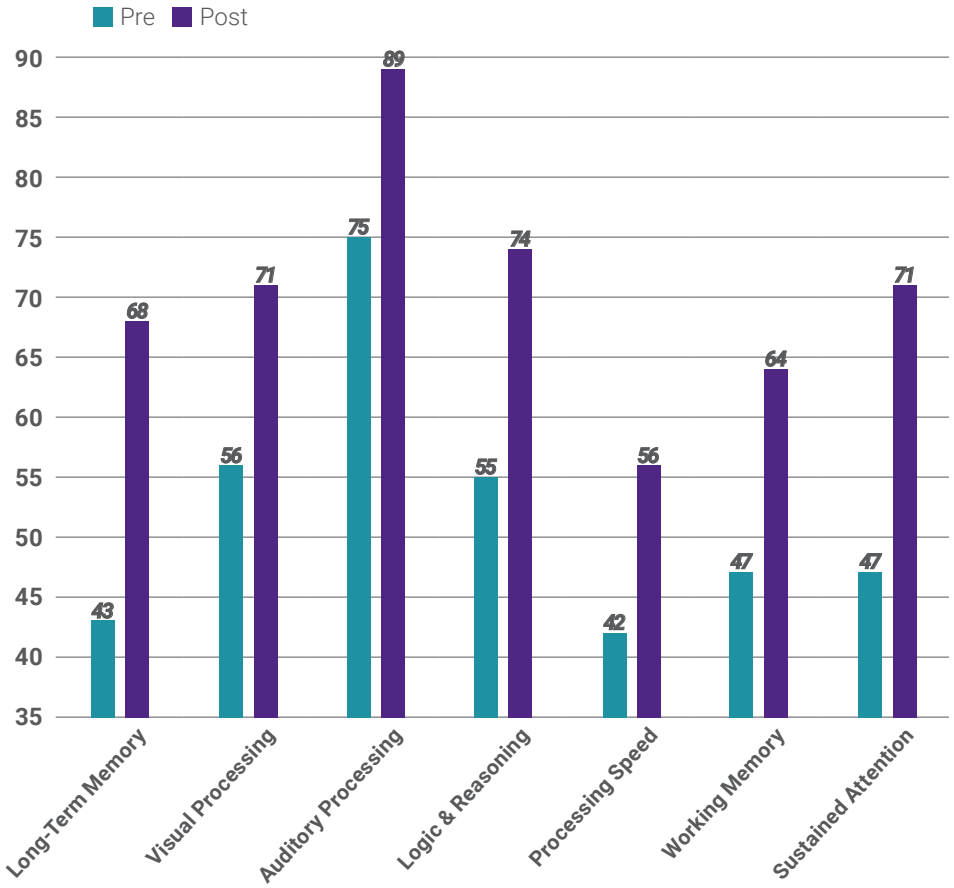
Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

BrainRx®

BRAINRX | COGNITIVE RESULTS | CHILDREN

Number of Clients	8,771	**Average Gains**	3.4 years
Ages	4-17	**Largest Gains**	4.3 years in Auditory Processing
Ave. Number of Training Hours	77		

PERCENTILE CHANGE



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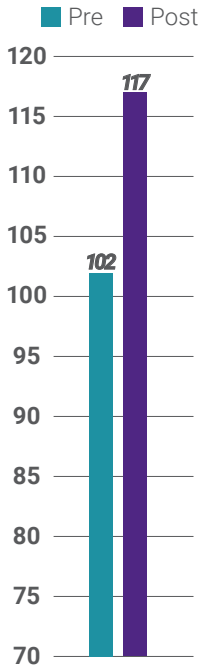

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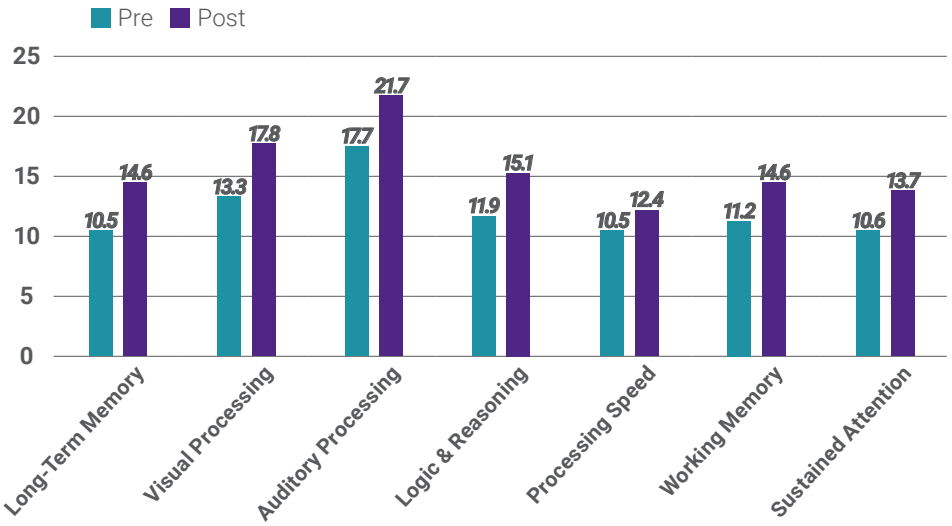


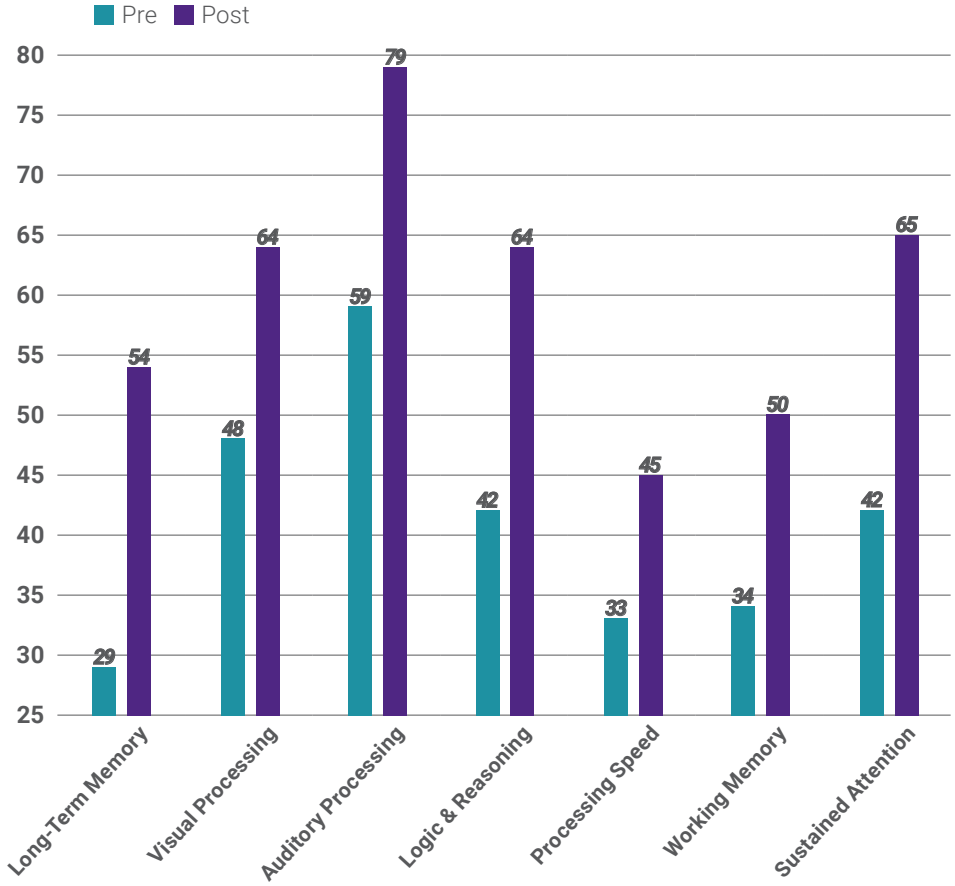
BrainRx®

Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

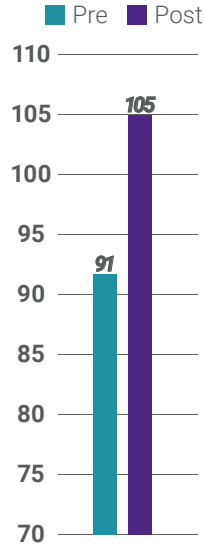
READRX | COGNITIVE RESULTS | CHILDREN

Number of Clients	12,255	**Average Gains**	3.5 years
Ages	4-17	**Largest Gains**	4.7 years in Auditory Processing
Ave. Number of Training Hours	120		

PERCENTILE CHANGE



IQ SCORE CHANGE



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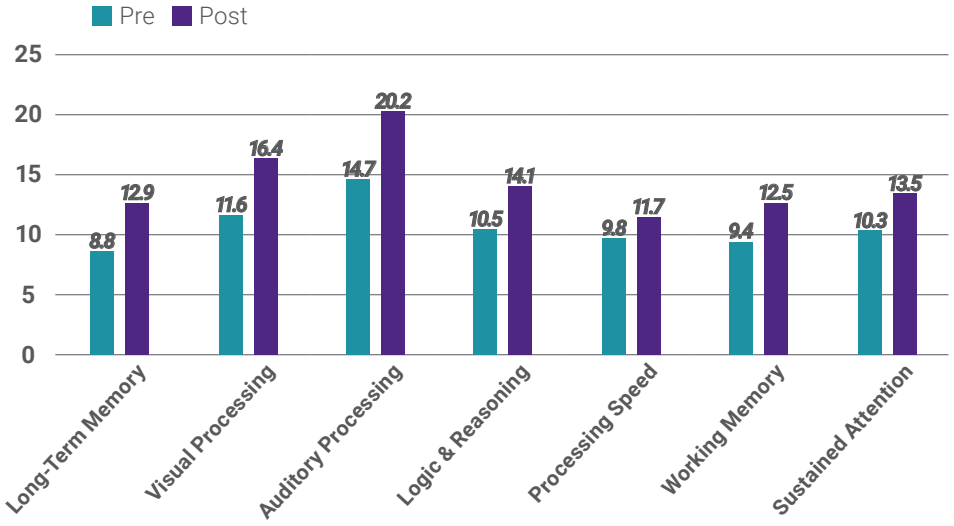


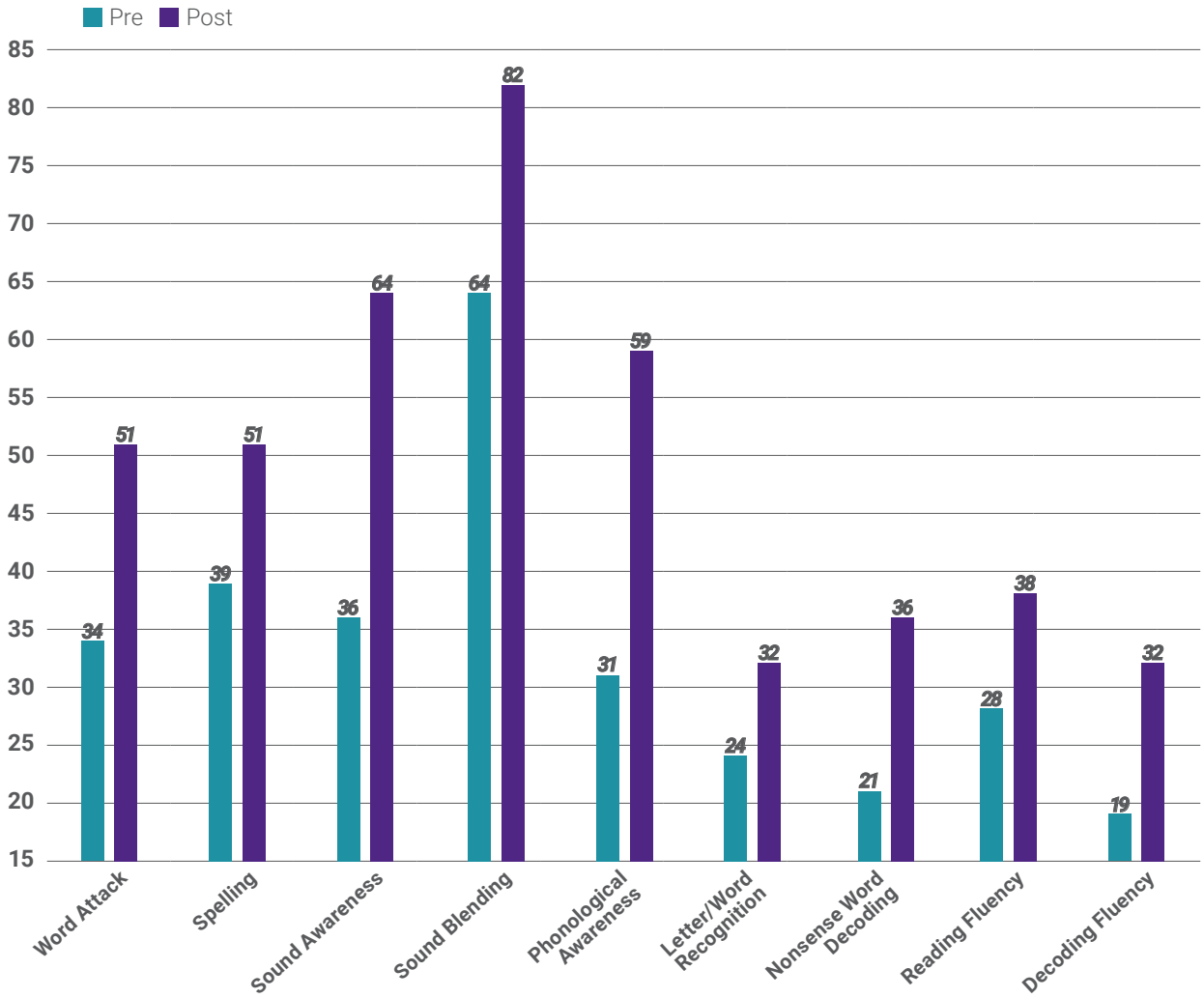
Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

BrainRx®

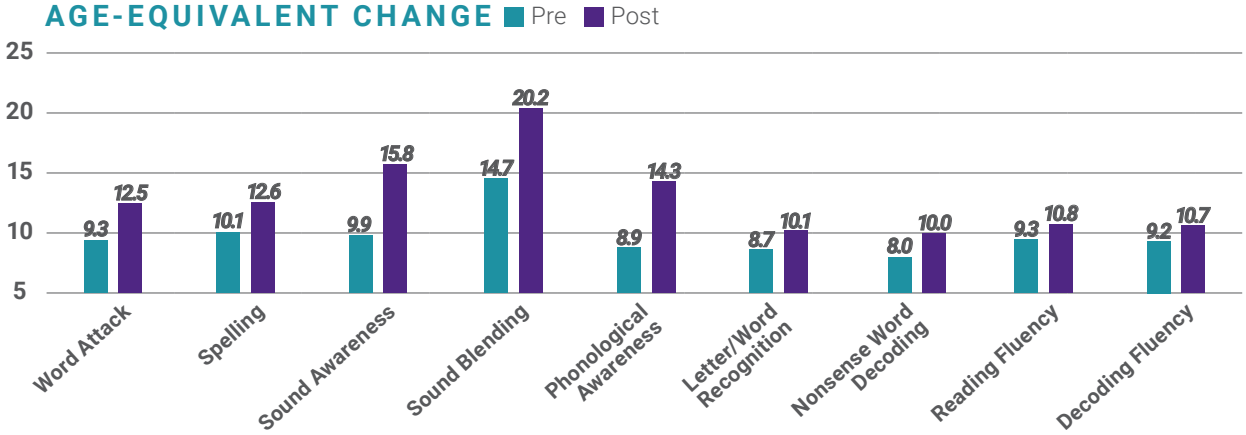
READRX | READING RESULTS | CHILDREN

Number of Clients	12,255	**Average Gains**	3.9 years
Ages	4-17	**Largest Gains**	5.7 years in Sound Awareness
Ave. Number of Training Hours	120		

PERCENTILE CHANGE



AGE-EQUIVALENT CHANGE



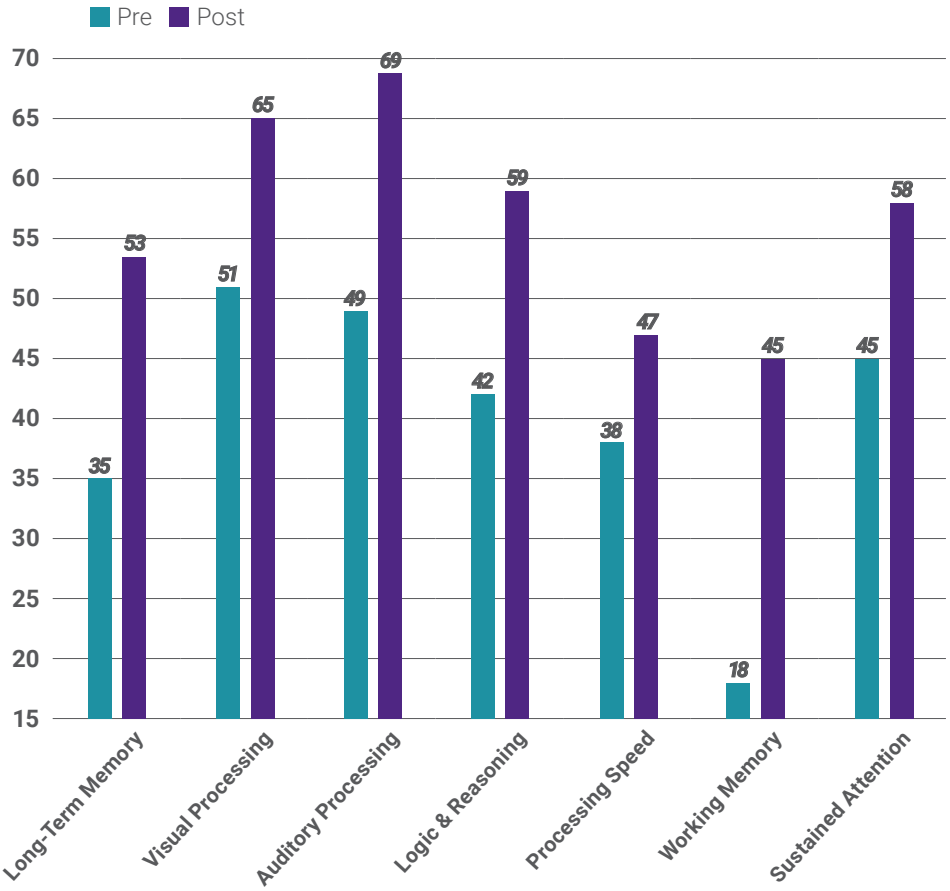
BrainRx®

Word Attack, Spelling, Sound Awareness, & Sound Blending are from Woodcock Johnson Tests of Achievement; Remaining subtests are from Kaufman Tests of Achievement. Changes in standard scores were statistically significant at $p < .001$ on all measures.

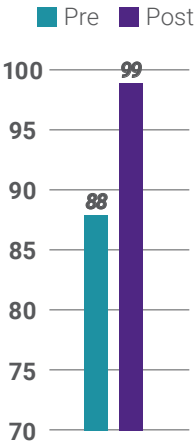
ACCELERATERX | COGNITIVE RESULTS | CHILDREN

Number of Clients	1,773	**Average Gains**	1.7 years
Ages	4-17	**Largest Gains**	3.1 years in Auditory Processing
Ave. Number of Training Hours	60		

PERCENTILE CHANGE



IQ SCORE CHANGE



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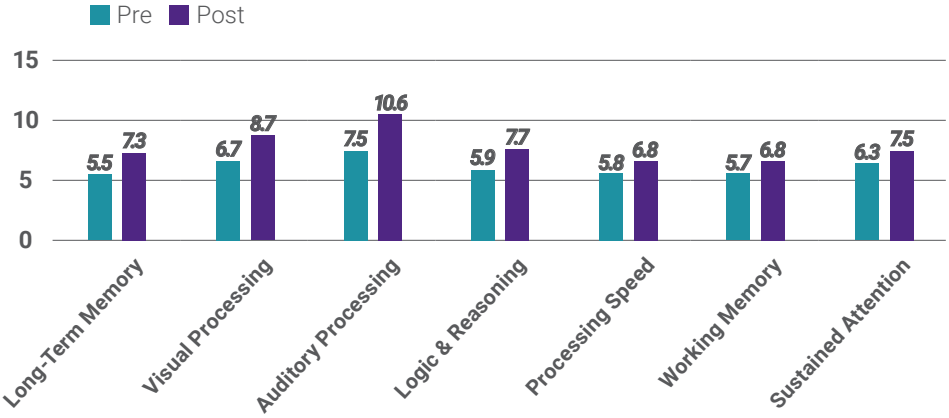


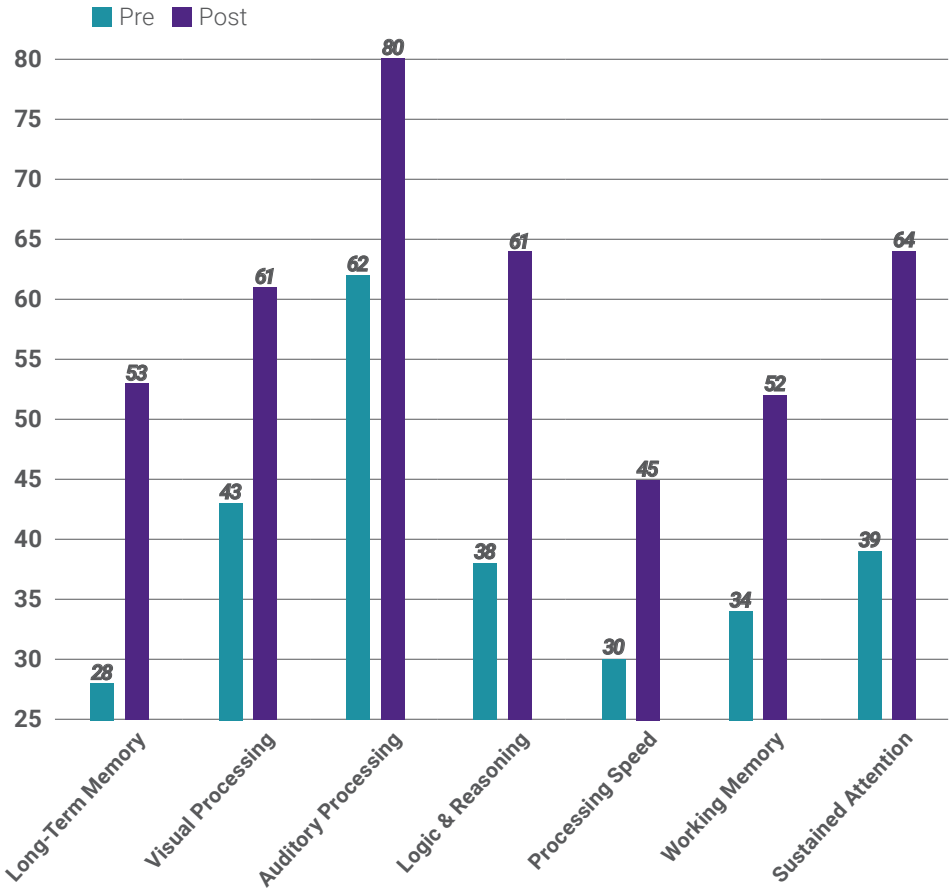
Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

BrainRx®

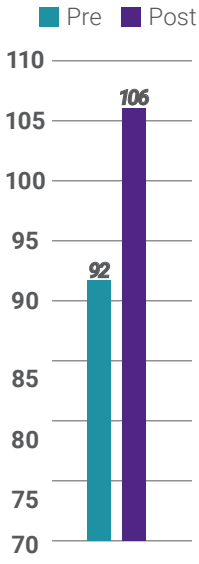
MATHRX | COGNITIVE RESULTS | CHILDREN

Number of Clients	3,519	**Average Gains**	3.5 years
Ages	5-17	**Largest Gains**	4.9 years in Visual Processing
Ave. Number of Training Hours	120		

PERCENTILE CHANGE



IQ SCORE CHANGE



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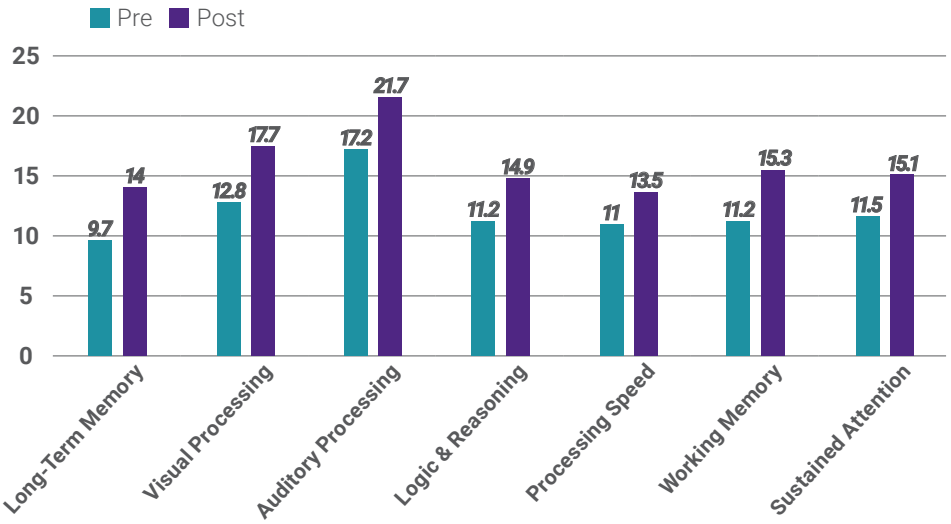


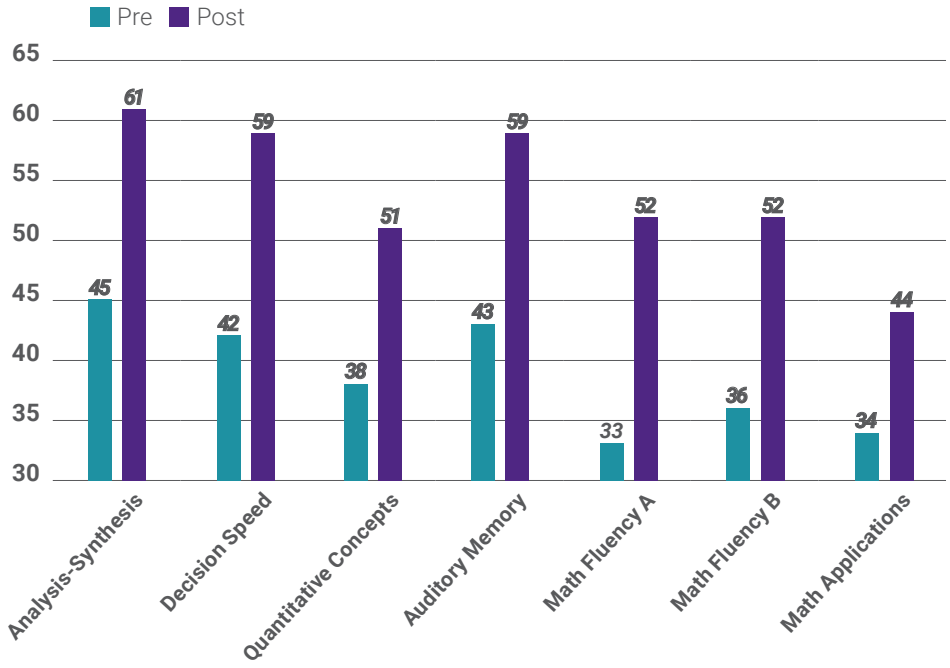
BrainRx®

Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

MATHRX | MATH RESULTS | CHILDREN

Number of Clients	3,519	**Average Gains**	2.8 years
Ages	5-17	**Largest Gains**	3.5 years in Quantitative Concepts
Ave. Number of Training Hours	120		

PERCENTILE CHANGE



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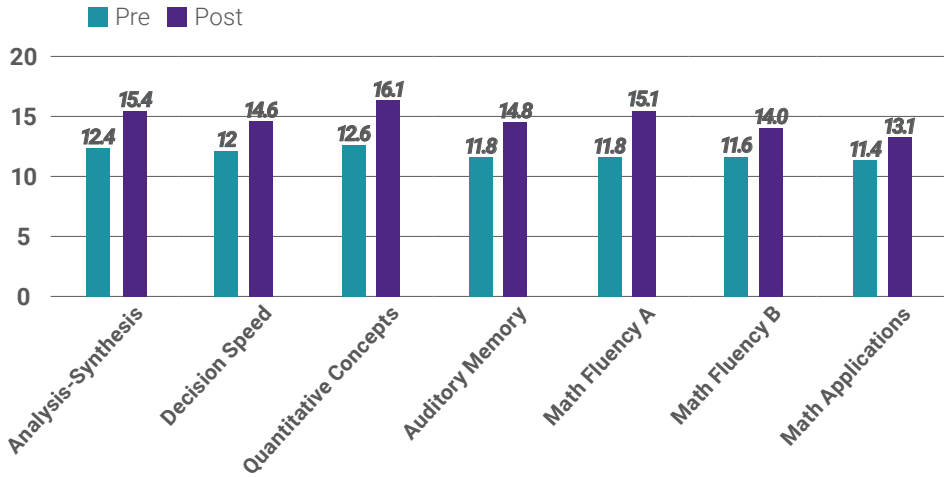
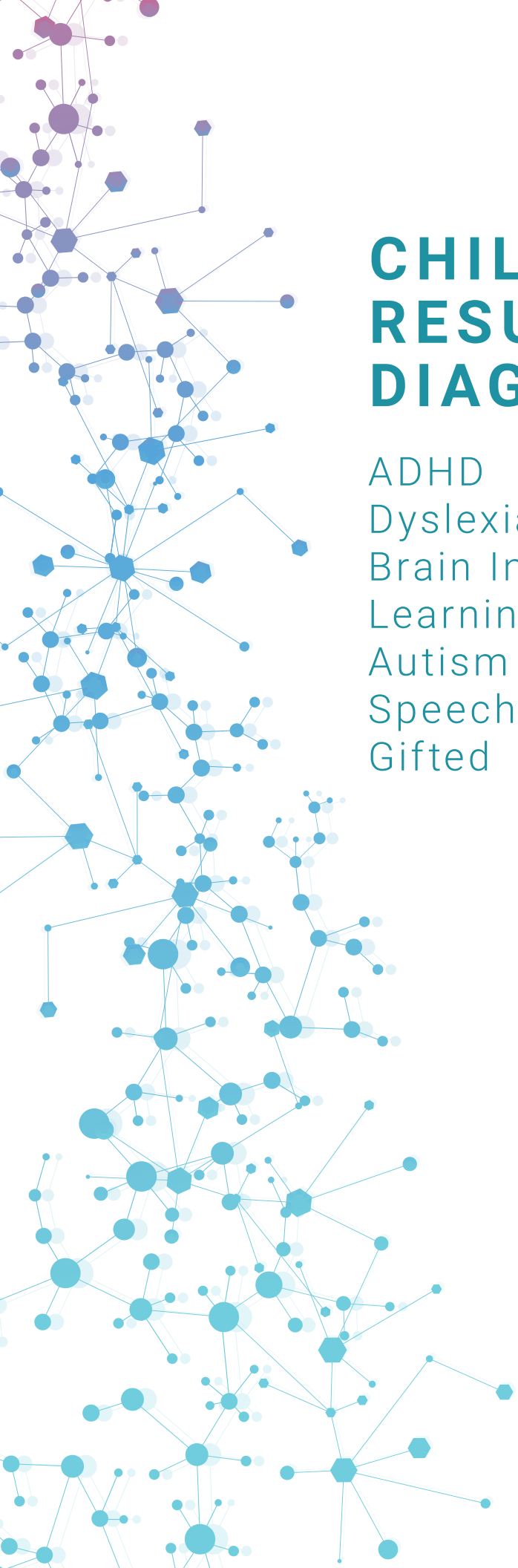


Math Fluency B and Math Applications are from Kaufman Tests of Achievement. Remaining subtests are from Woodcock Johnson Tests of Achievement; Changes in standard scores were statistically significant at $p < .001$ on all measures.

BrainRx®



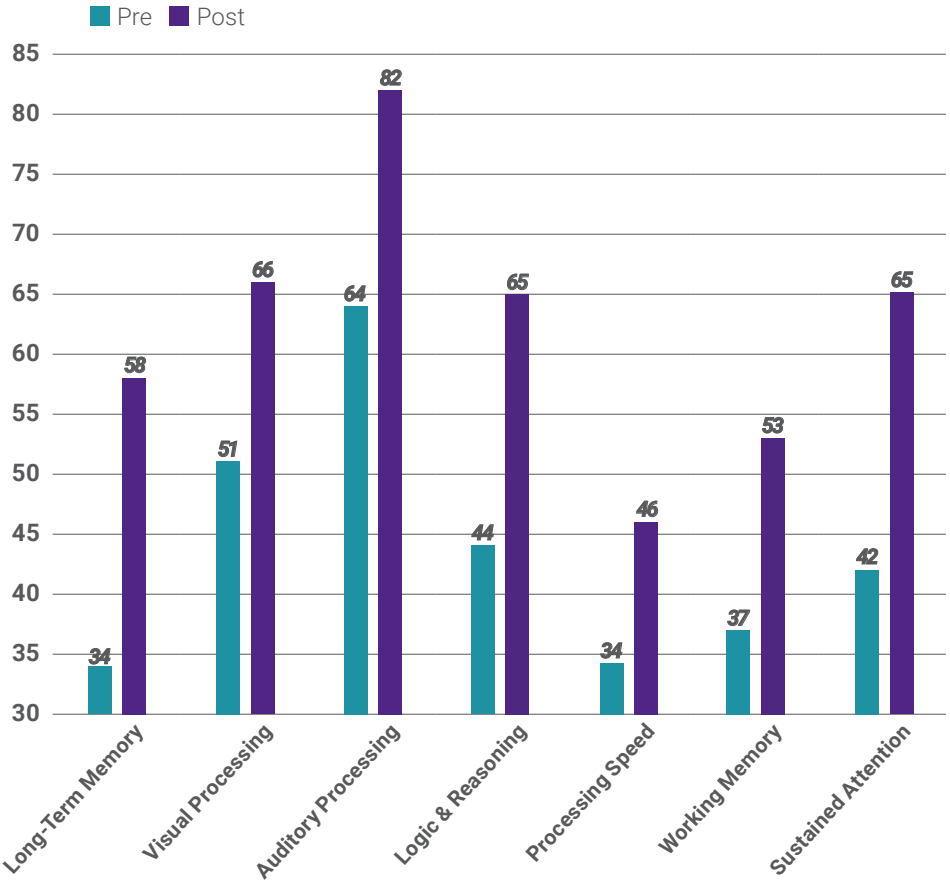
CHILDREN: RESULTS BY DIAGNOSIS

ADHD
Dyslexia
Brain Injury
Learning Disability
Autism Spectrum
Speech & Language Disorder
Gifted

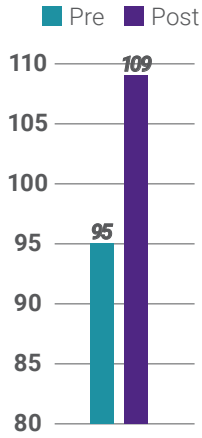
ADHD | COGNITIVE RESULTS | CHILDREN

Number of Clients	7,506	**Average Gains**	3.5 years
Ages	4-17	**Largest Gains**	4.5 years in Auditory Processing
Ave. Number of Training Hours	77		

PERCENTILE CHANGE



IQ SCORE CHANGE



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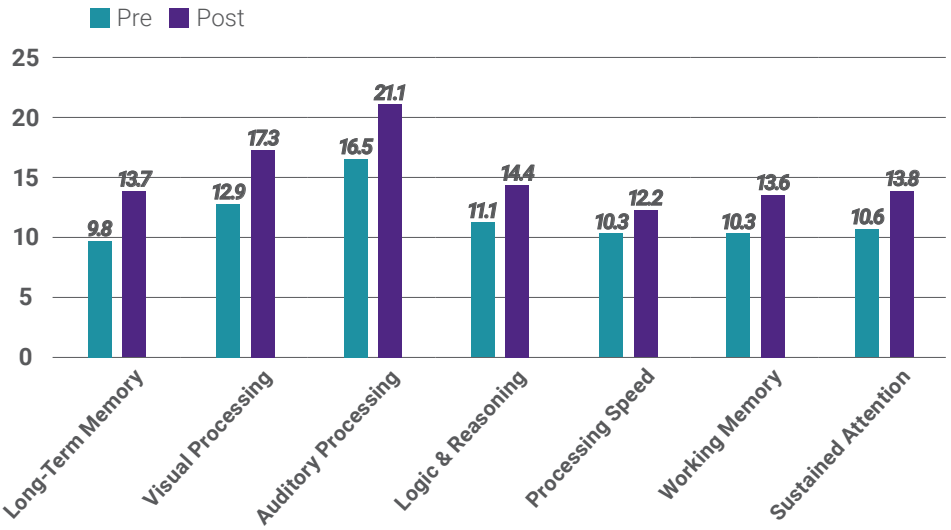


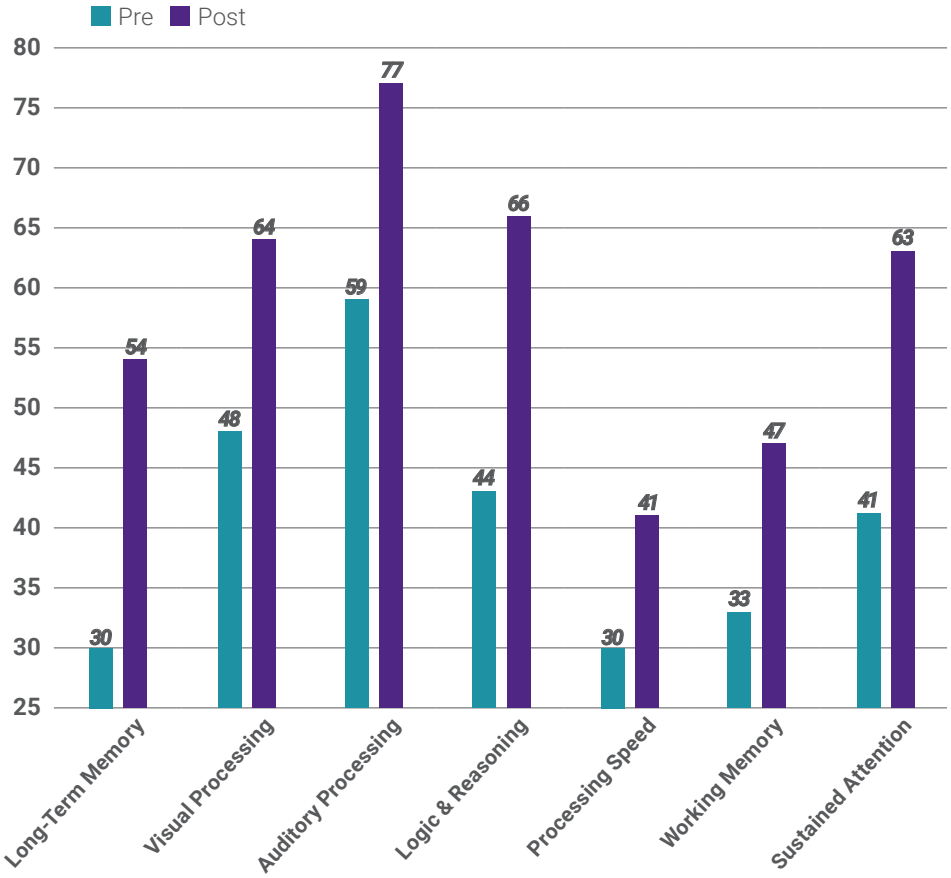
Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

BrainRx®

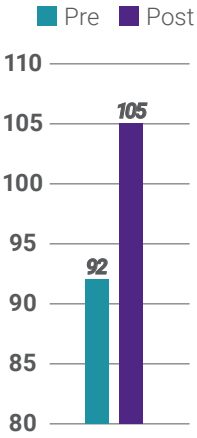
DYSLEXIA | COGNITIVE RESULTS | CHILDREN

Number of Clients	3,082	**Average Gains**	3.5 years
Ages	4-17	**Largest Gains**	4.9 years in Auditory Processing
Ave. Number of Training Hours	97		

PERCENTILE CHANGE



IQ SCORE CHANGE



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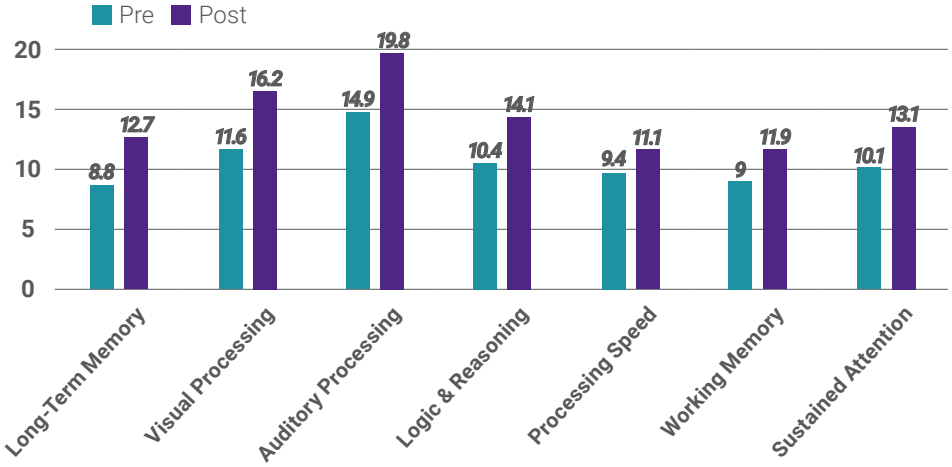


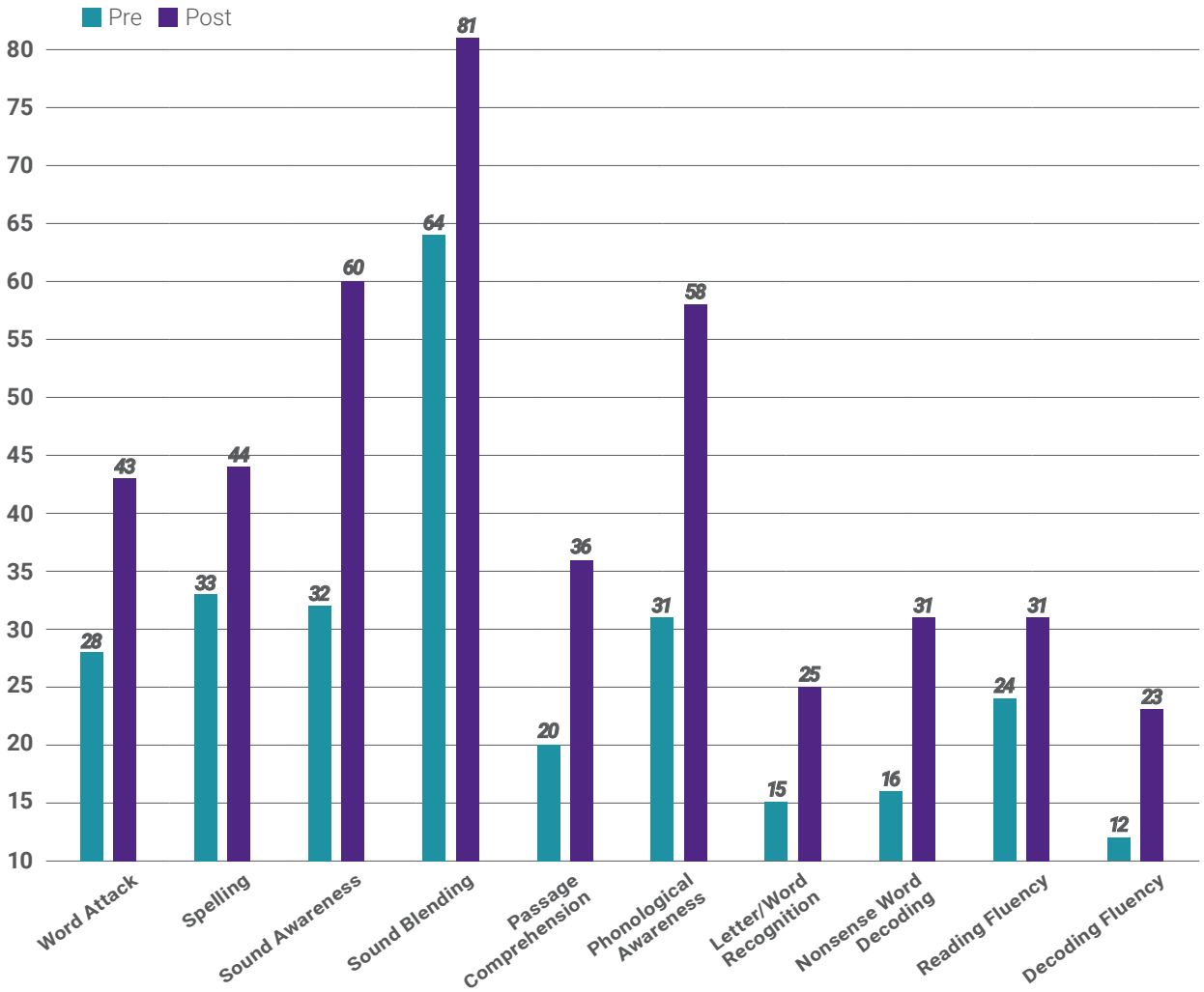
BrainRx®

Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

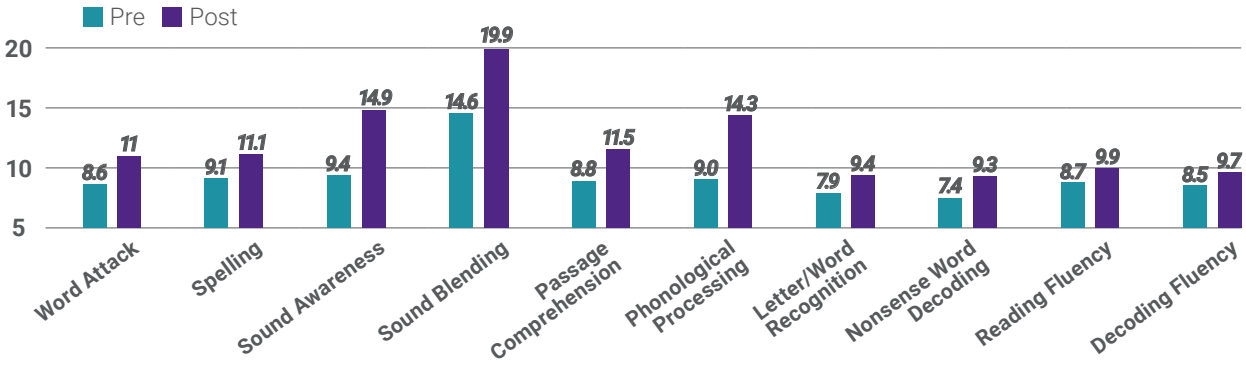
DYSLEXIA | READING RESULTS | CHILDREN

Number of Clients	3,082	**Average Gains**	3.3 years
Ages	5-17	**Largest Gains**	5.4 years in Sound Awareness
Ave. Number of Training Hours	120		

PERCENTILE CHANGE



AGE-EQUIVALENT CHANGE



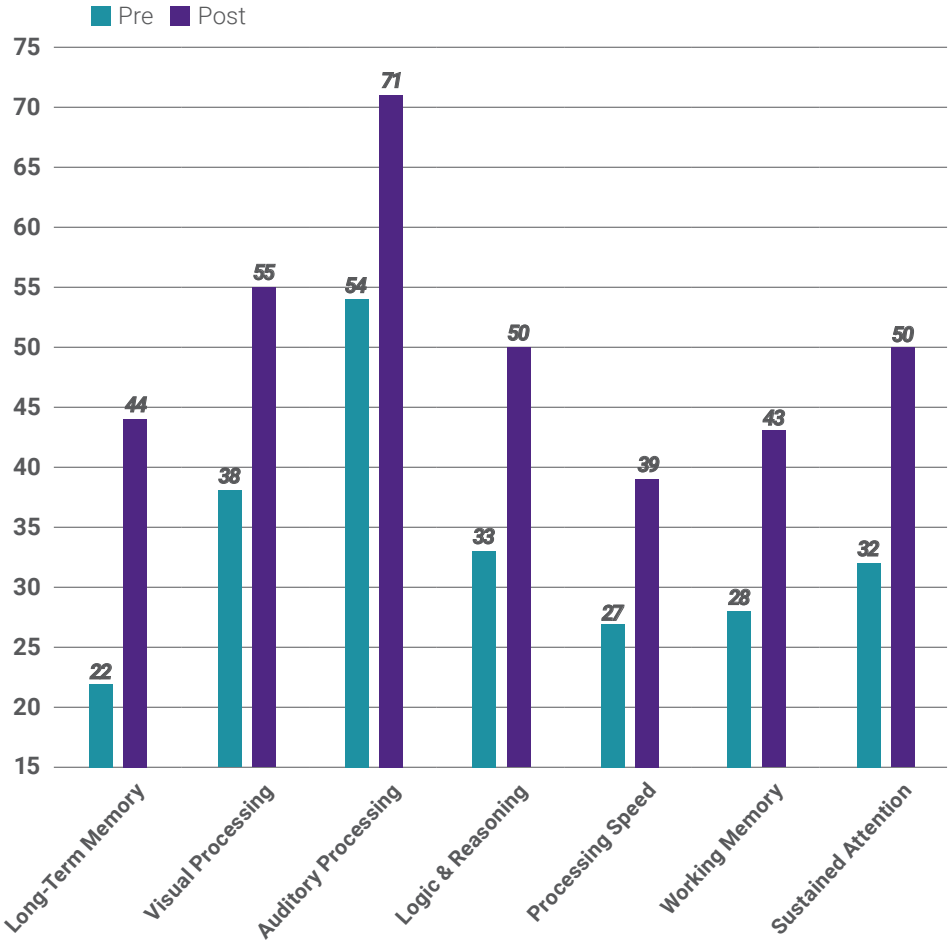
Word Attack, Spelling, Sound Awareness, Sound Blending, & Passage Comprehension are from Woodcock Johnson Tests of Achievement; Remaining subtests are from Kaufman Tests of Achievement. Changes in standard scores were statistically significant on all measures.

BrainRx®

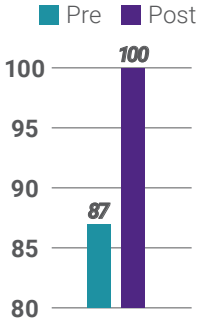
BRAIN INJURY | COGNITIVE RESULTS | CHILDREN

Number of Clients	210	**Average Gains**	3.3 years
Ages	5-17	**Largest Gains**	4.3 years in Visual Processing
Ave. Number of Training Hours	96		

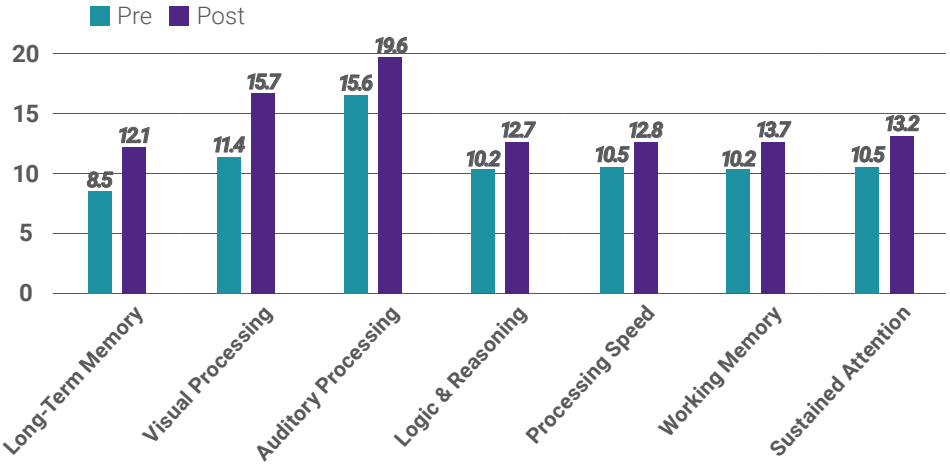
PERCENTILE CHANGE



IQ SCORE CHANGE



AGE-EQUIVALENT CHANGE



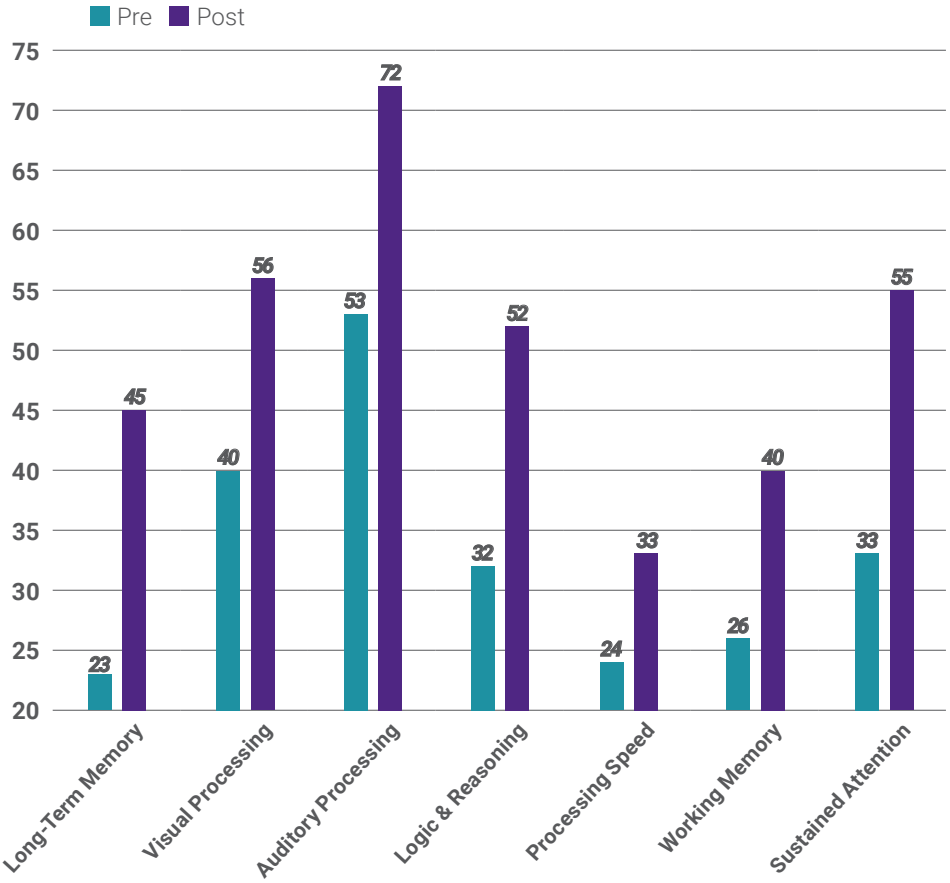
BrainRx®

Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

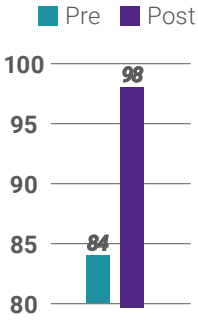
LEARNING DISABILITY | COGNITIVE RESULTS | CHILDREN

Number of Clients	2,804	**Average Gains**	3.5 years
Ages	4-17	**Largest Gains**	4.8 years in Auditory Processing
Ave. Number of Training Hours	89		

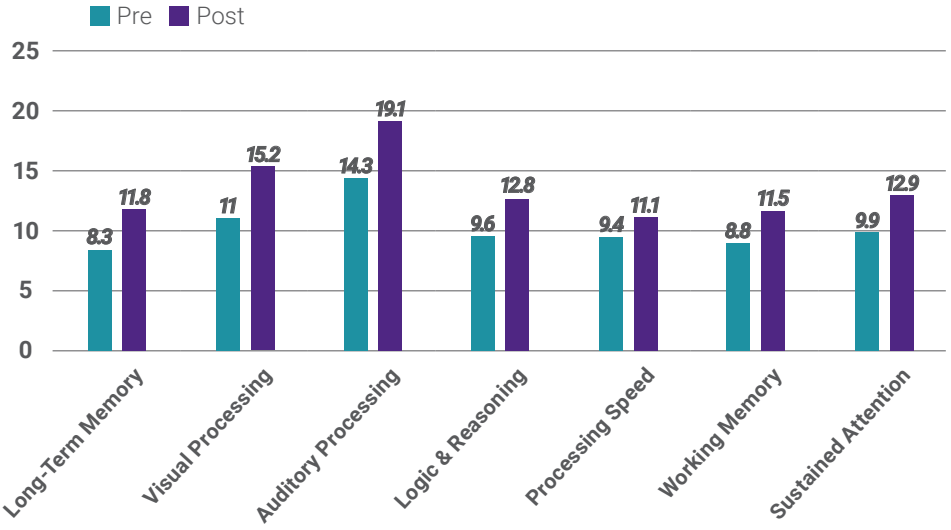
PERCENTILE CHANGE



IQ SCORE CHANGE



AGE-EQUIVALENT CHANGE



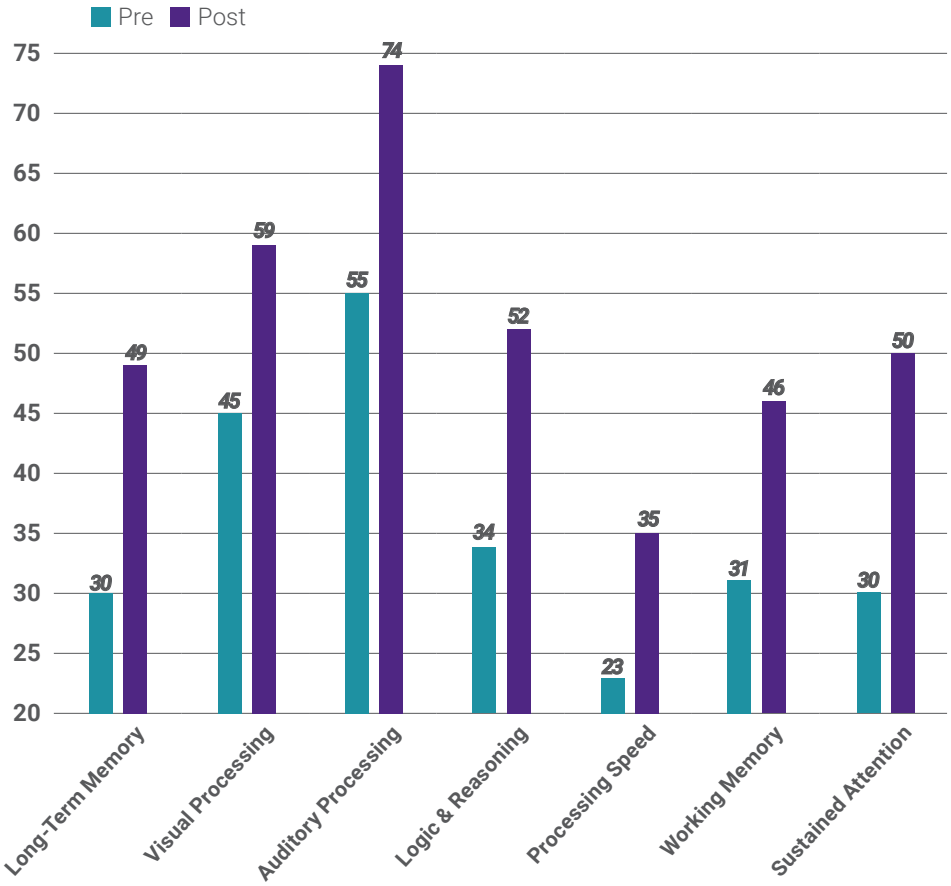
Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

BrainRx®

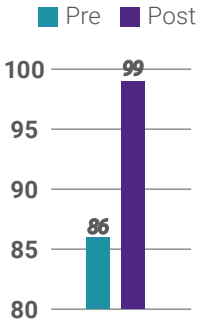
AUTISM SPECTRUM | COGNITIVE RESULTS | CHILDREN

Number of Clients	1,098	**Average Gains**	3.1 years
Ages	4-17	**Largest Gains**	4.8 years in Auditory Processing
Ave. Number of Training Hours	88		

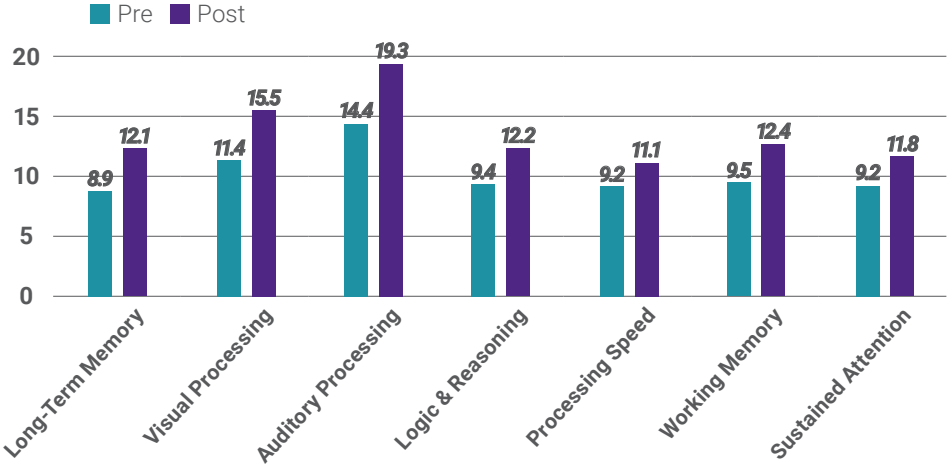
PERCENTILE CHANGE



IQ SCORE CHANGE



AGE-EQUIVALENT CHANGE



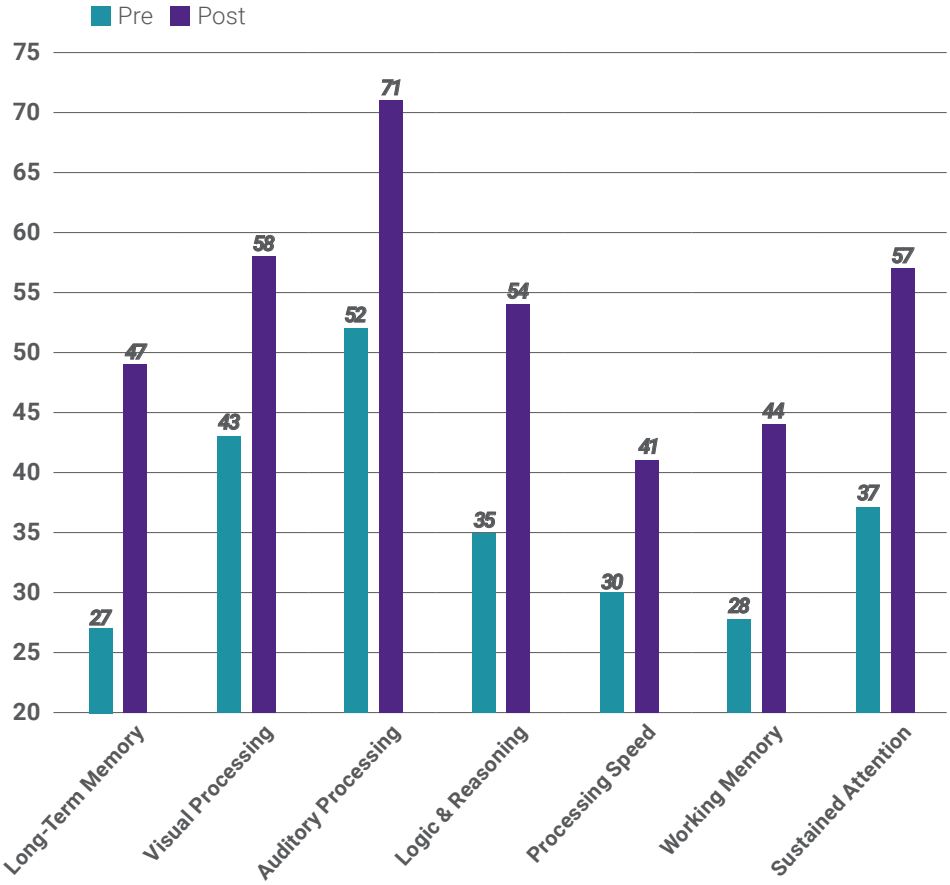
BrainRx®

Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

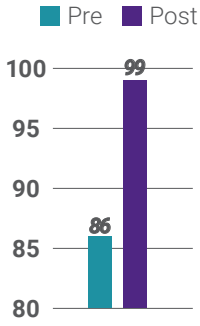
SPEECH & LANGUAGE | COGNITIVE RESULTS | CHILDREN

Number of Clients	2,741	**Average Gains**	3.1 years
Ages	4-17	**Largest Gains**	4.8 years in Auditory Processing
Ave. Number of Training Hours	83		

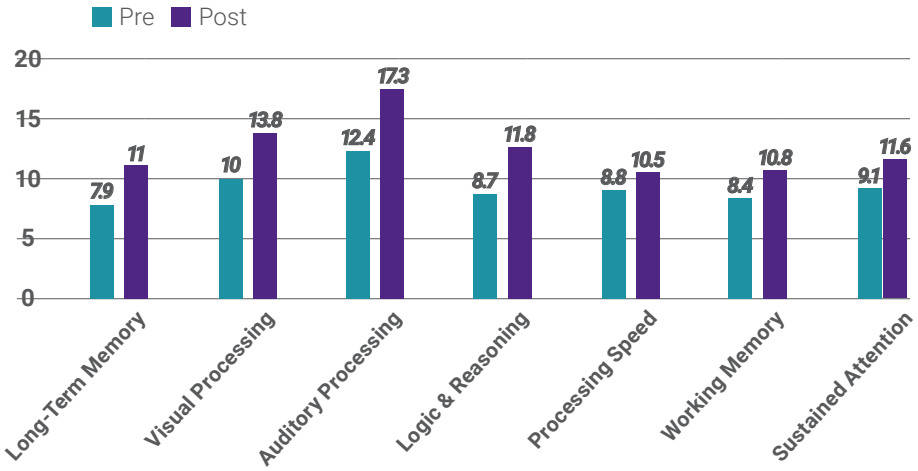
PERCENTILE CHANGE



IQ SCORE CHANGE



AGE-EQUIVALENT CHANGE



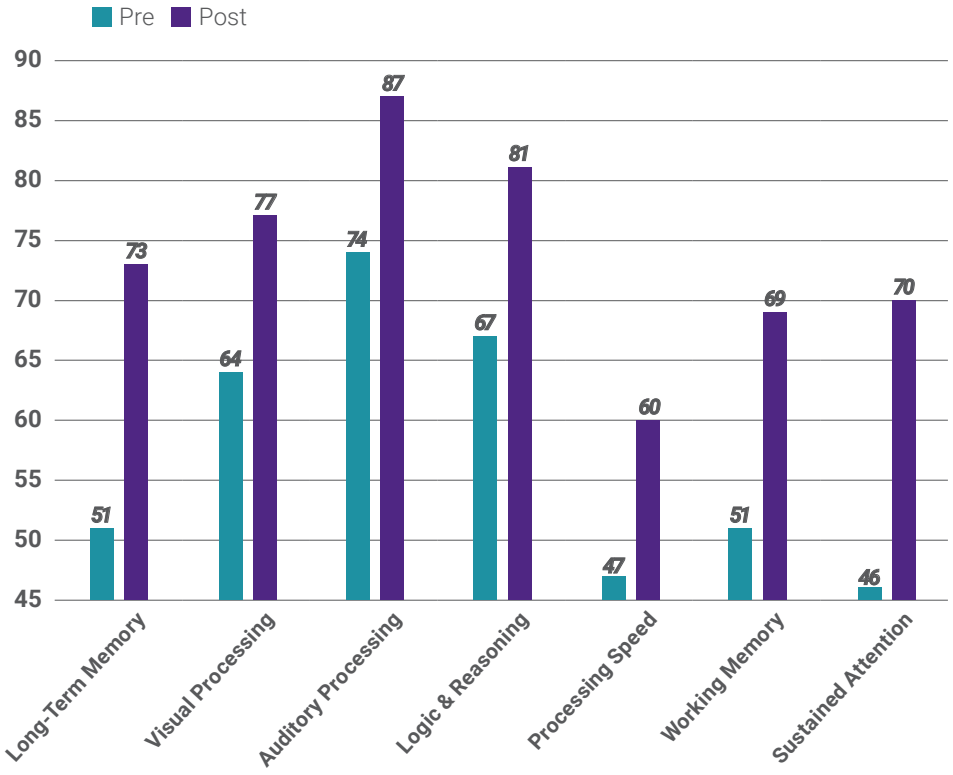
Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 OR p = .00 on all measures.

BrainRx®

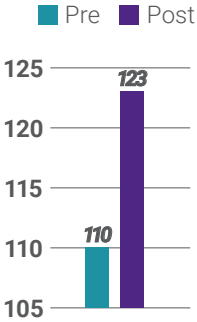
GIFTED | COGNITIVE RESULTS | CHILDREN

Number of Clients	795	**Average Gains**	3.3 years
Ages	4-17	**Largest Gains**	4.2 years in Visual Processing
Ave. Number of Training Hours	77		

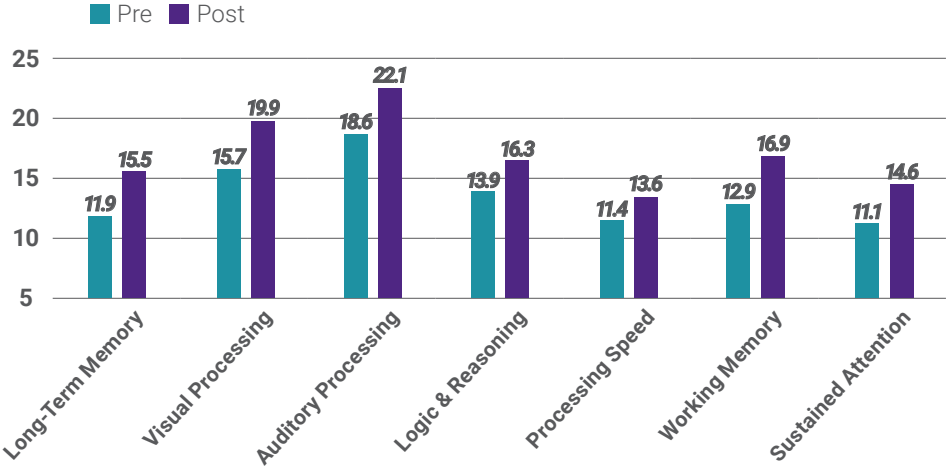
PERCENTILE CHANGE



IQ SCORE CHANGE



AGE-EQUIVALENT CHANGE



BrainRx®

Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 OR p = .00 on all measures.

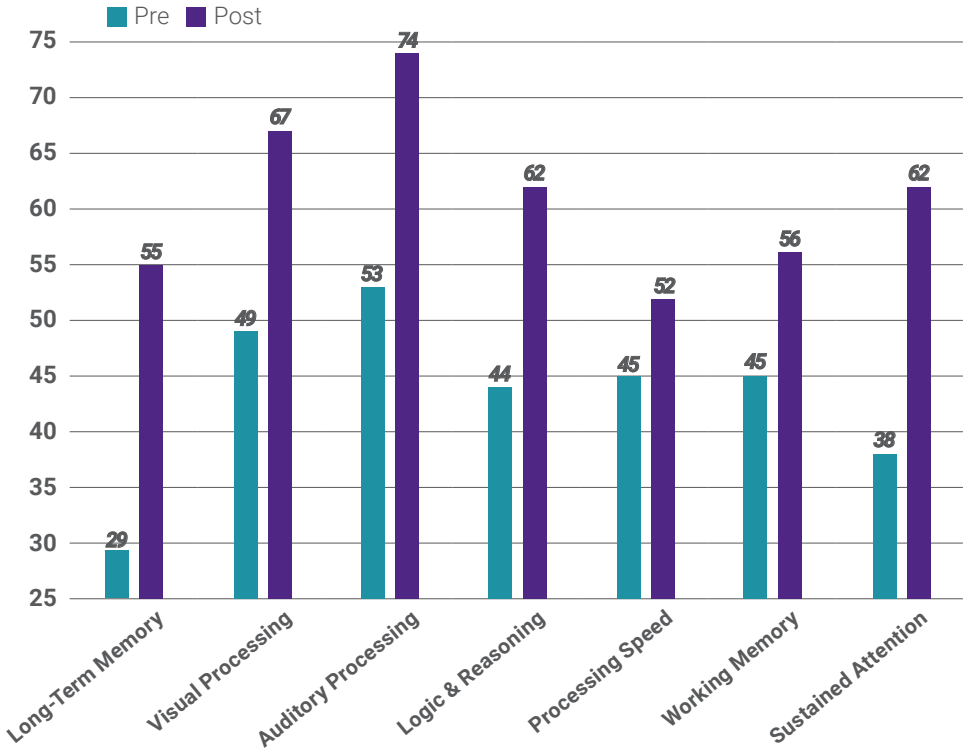
ADULTS: RESULTS BY PROGRAM

All Programs
BrainRx
ReadRx
MathRx

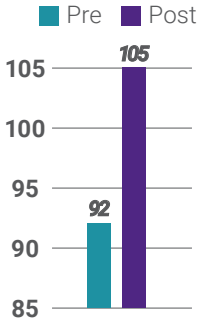
ALL PROGRAMS | COGNITIVE RESULTS | ADULTS

Number of Clients 2,692 **Ages** 18-95 **Ave. Number of Training Hours** 88

ALL PROGRAMS: COGNITIVE RESULTS PERCENTILE CHANGE



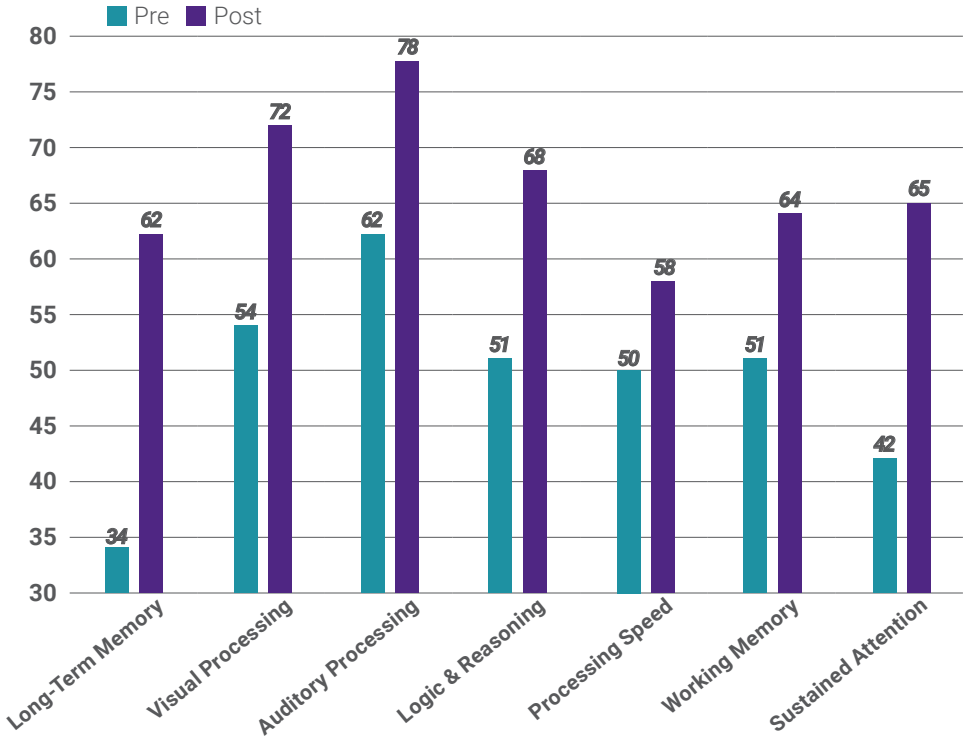
IQ SCORE CHANGE



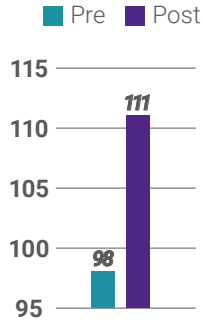
ADULTS: RESULTS BY PROGRAM

BRAINRX: COGNITIVE RESULTS PERCENTILE CHANGE

Number of Clients 1,380 **Ages** 18-95 **Ave. Number of Training Hours** 58



IQ SCORE CHANGE



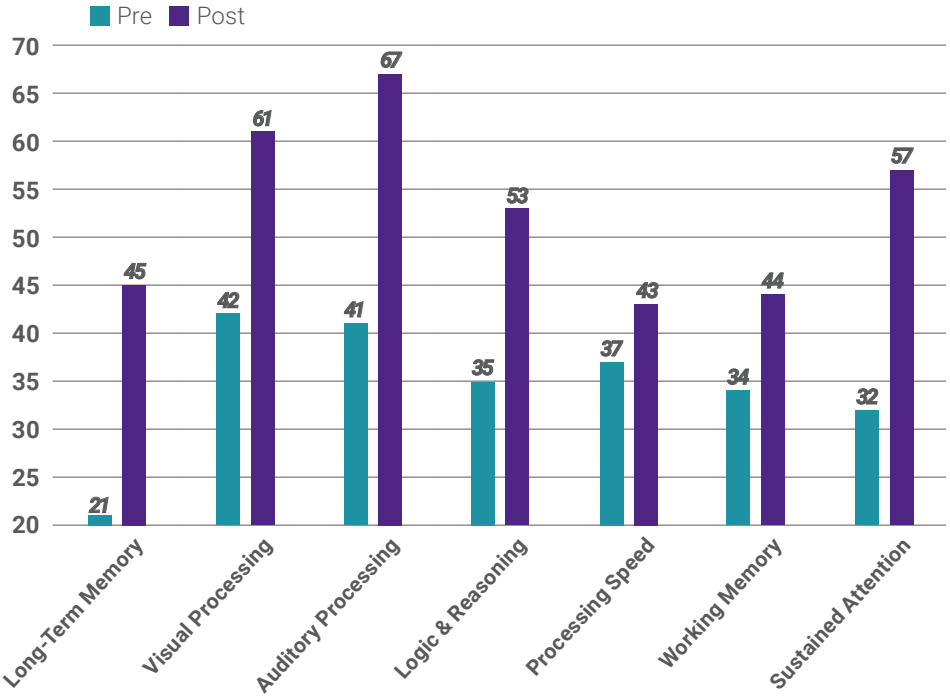
BrainRx®

Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures.

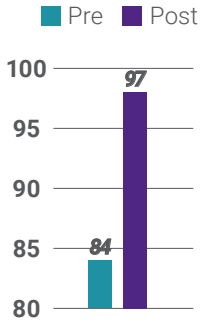
READRX | COGNITIVE & READING RESULTS | ADULTS

Number of Clients 1,009 **Ages** 18-83 **Ave. Number of Training Hours** 108

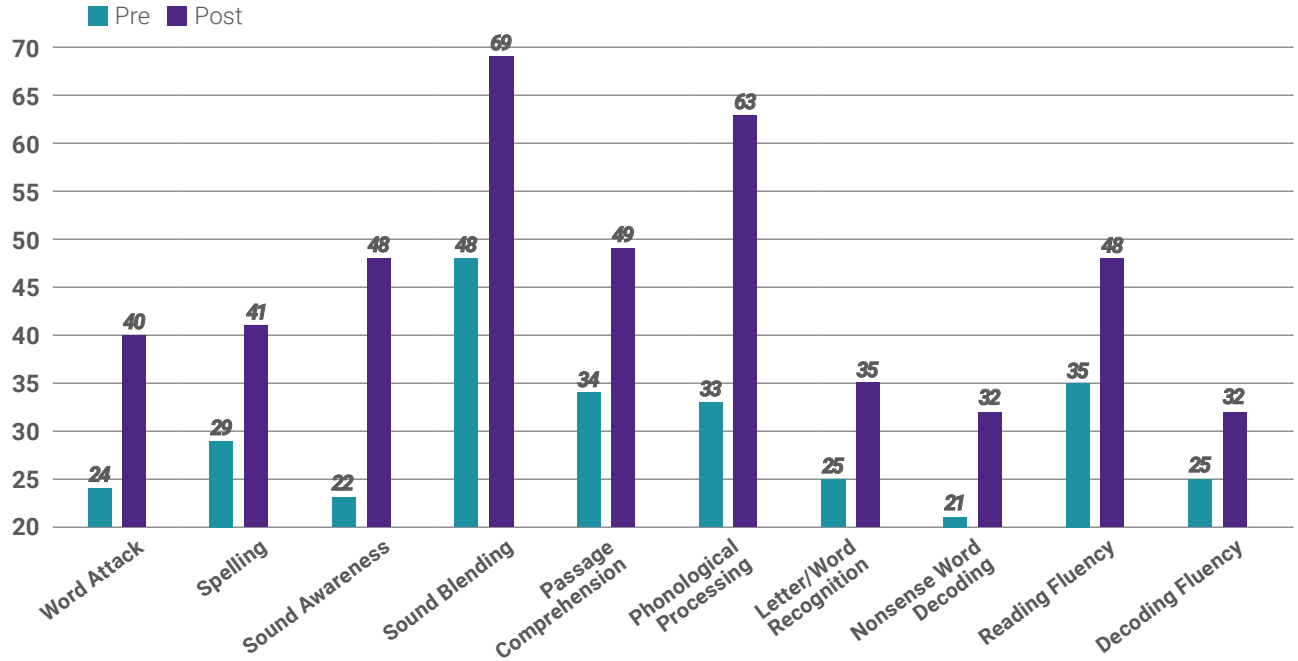
READRX:COGNITIVE RESULTS PERCENTILE CHANGE



IQ SCORE CHANGE



READRX:READING RESULTS PERCENTILE CHANGE



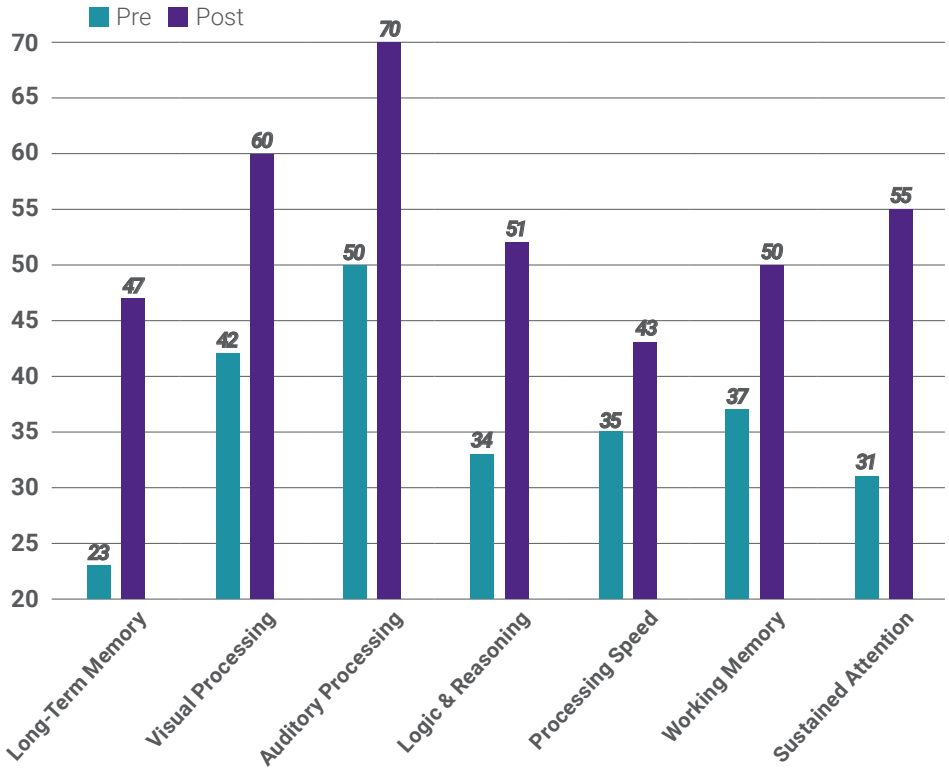
Standard scores & percentiles are aggregated across all test batteries; AE scores reported from Woodcock Johnson only Changes in standard scores were statistically significant at p < .001 on all measures except Decoding Fluency (p = .006).

BrainRx®

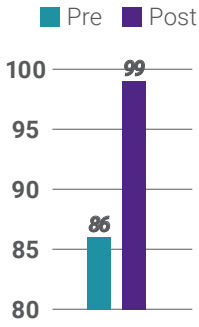
MATHRX | COGNITIVE & MATH RESULTS | ADULTS

Number of Clients 463 **Ages** 18-78 **Ave. Number of Training Hours** 117

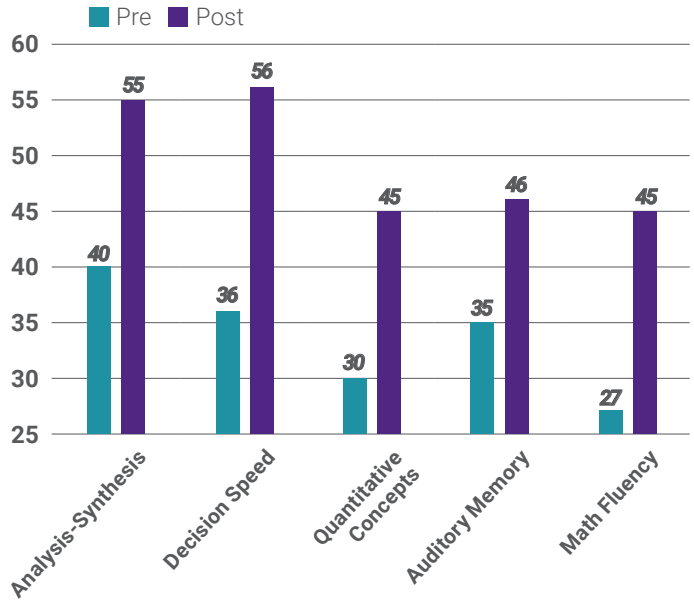
MATHRX: COGNITIVE RESULTS PERCENTILE CHANGE



IQ SCORE CHANGE

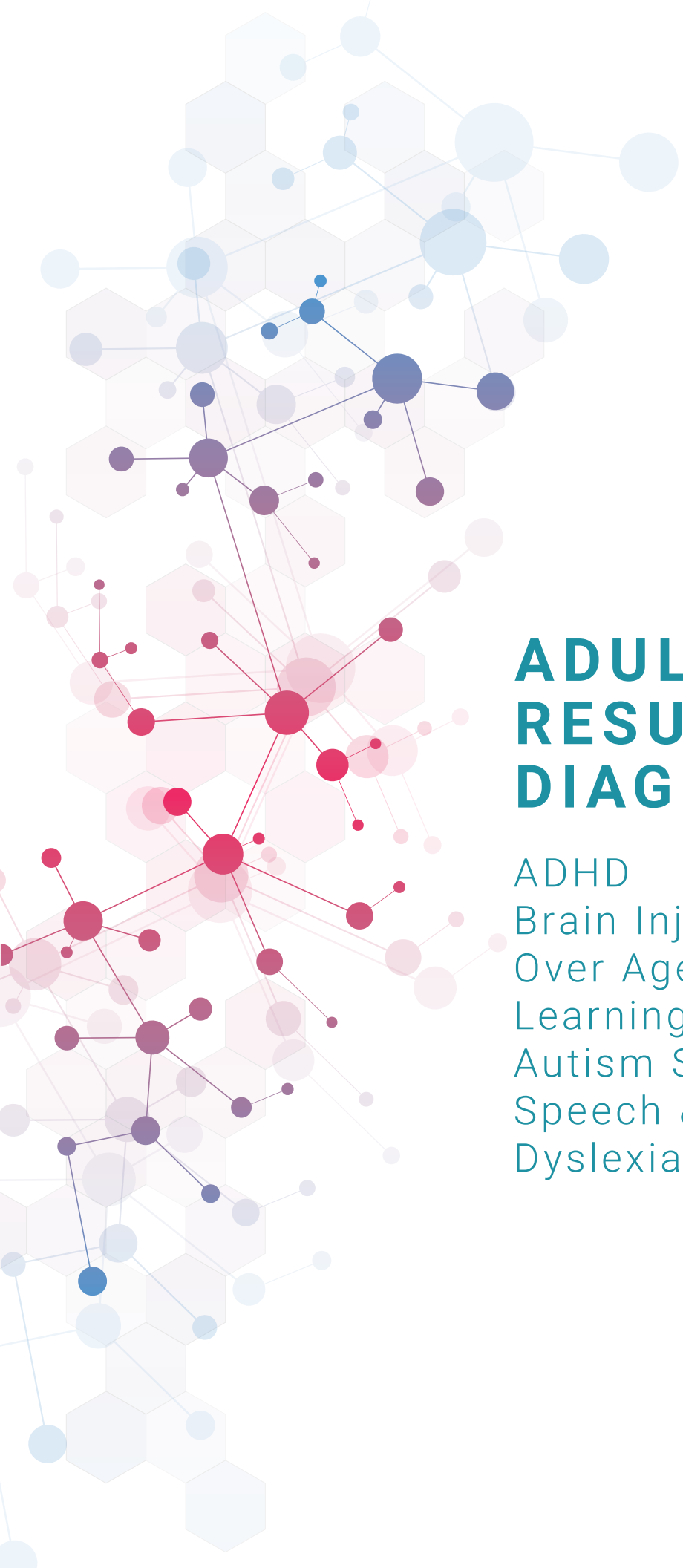


MATHRX: MATH RESULTS PERCENTILE CHANGE



BrainRx®

Standard scores & percentiles on cognitive measures are aggregated across all test batteries; Math-specific measures are from Woodcock Johnson Tests of Cognitive Abilities and Achievement; Changes in standard scores were statistically significant at $p < .001$ on all measures.



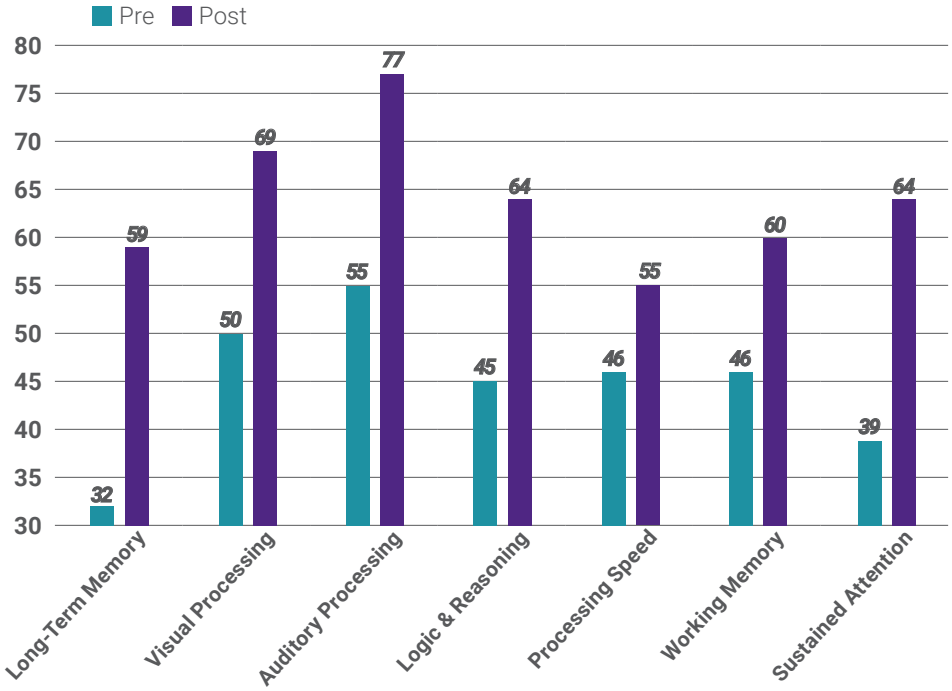
ADULTS: RESULTS BY DIAGNOSIS

ADHD
Brain Injury
Over Age 50
Learning Disability
Autism Spectrum
Speech & Language Disorder
Dyslexia

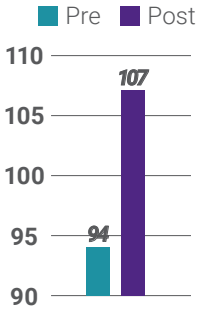
ADHD | COGNITIVE RESULTS | ADULTS

Number of Clients 772 **Ages** 18-76 **Ave. Number of Training Hours** 82

ADHD:COGNITIVE RESULTS PERCENTILE CHANGE



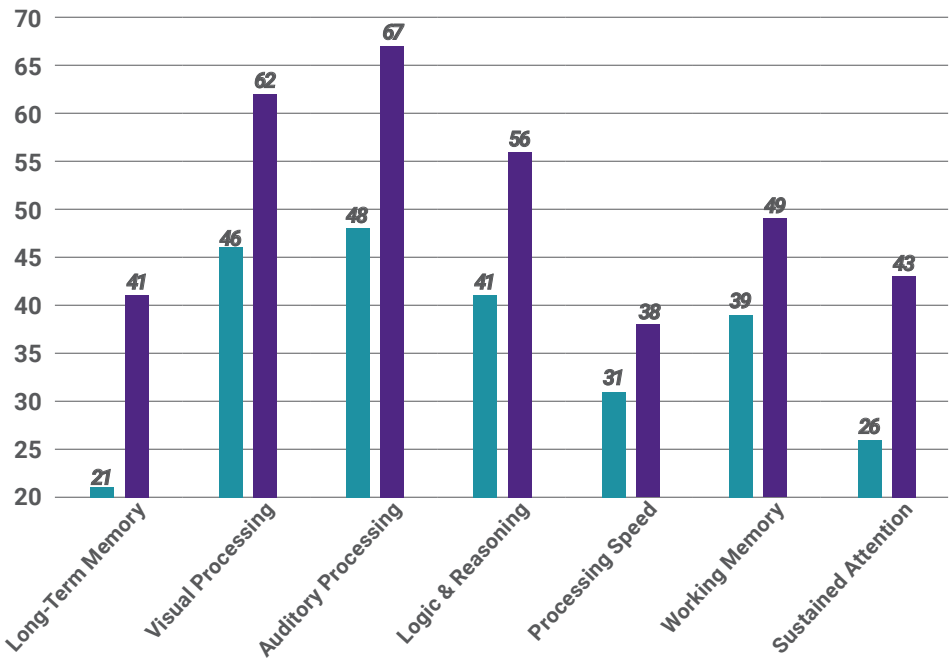
IQ SCORE CHANGE



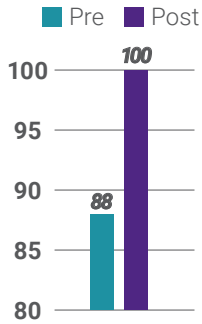
BRAIN INJURY | COGNITIVE RESULTS | ADULTS

Number of Clients 247 **Ages** 18-83 **Ave. Number of Training Hours** 93

BRAIN INJURY:COGNITIVE RESULTS PERCENTILE CHANGE



IQ SCORE CHANGE



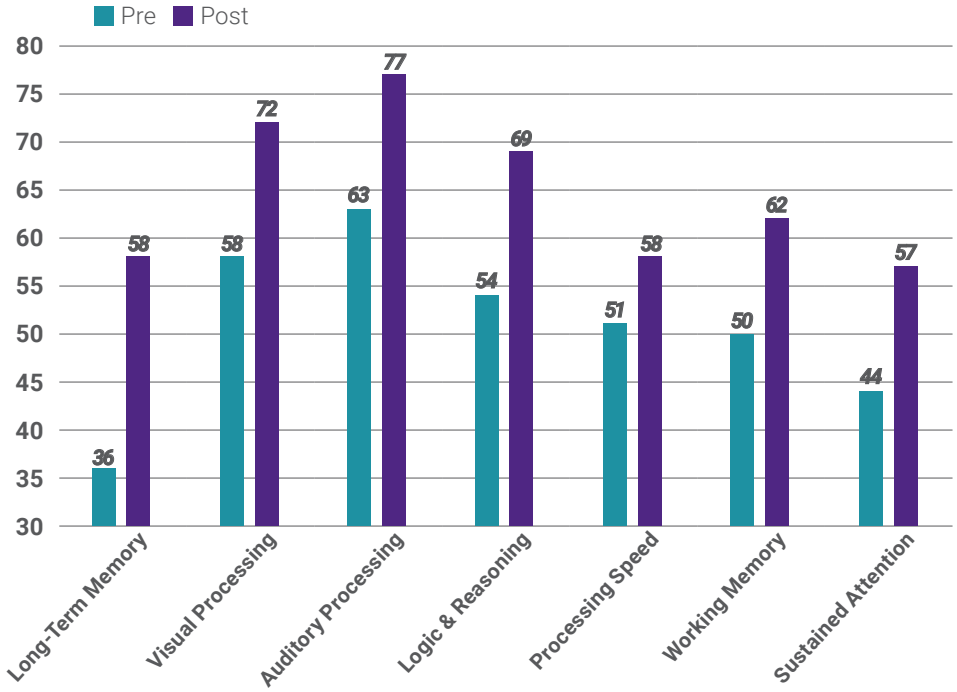
BrainRx®

Standard scores & percentiles on cognitive measures are aggregated across all test batteries; Changes in standard scores were statistically significant at $p < .001$ on all measures.

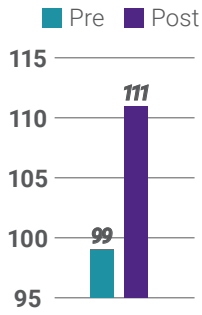
OVER AGE 50 | COGNITIVE RESULTS | ADULTS

Number of Clients 416 **Ages** 50-95 **Ave. Number of Training Hours** 71

OVER AGE 50:COGNITIVE RESULTS PERCENTILE CHANGE



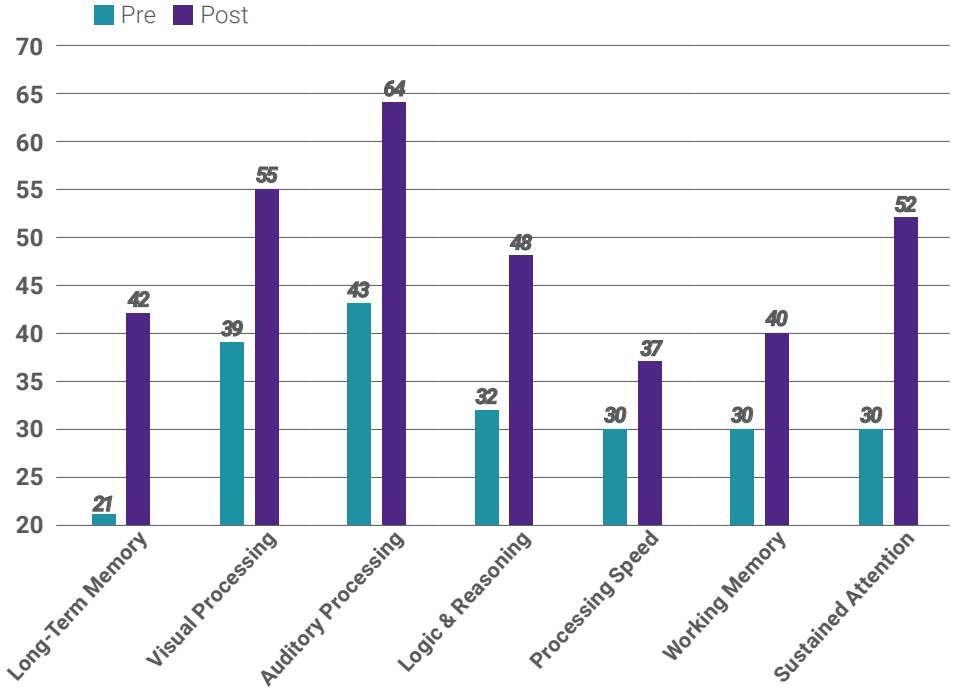
IQ SCORE CHANGE



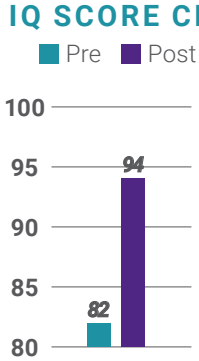
LEARNING DISABILITY | COGNITIVE RESULTS | ADULTS

Number of Clients 448 **Ages** 18-76 **Ave. Number of Training Hours** 92

LEARNING DISABILITY:COGNITIVE RESULTS PERCENTILE CHANGE



IQ SCORE CHANGE



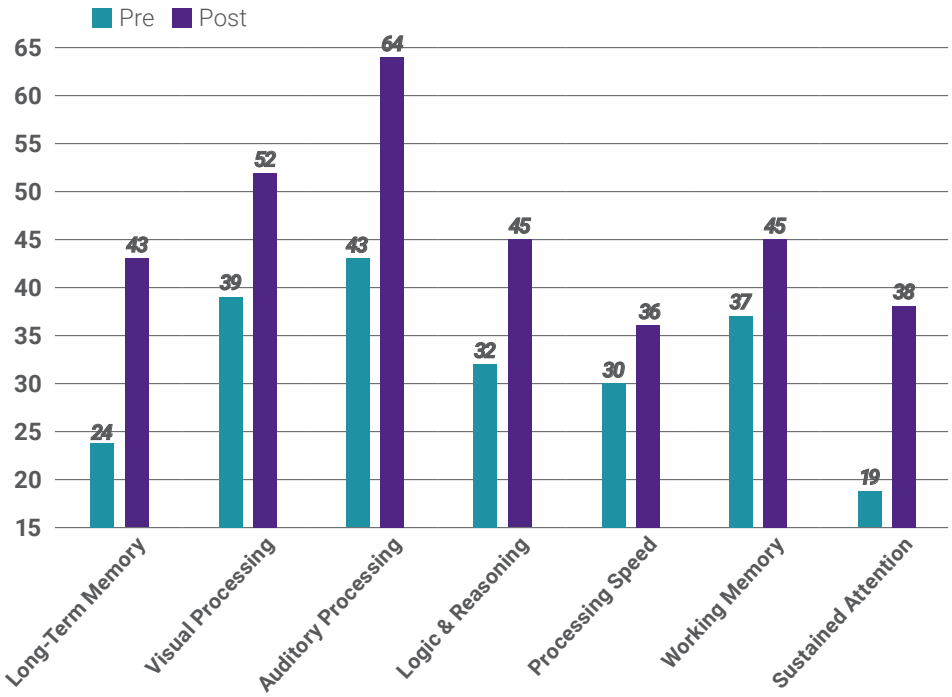
Standard scores & percentiles on cognitive measures are aggregated across all test batteries; Changes in standard scores were statistically significant at $p < .001$ on all measures.

BrainRx®

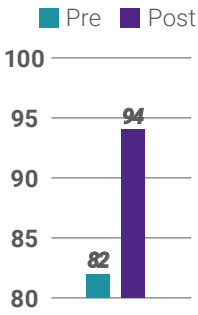
AUTISM SPECTRUM | COGNITIVE RESULTS | ADULTS

Number of Clients 169 **Ages** 18-52 **Ave. Number of Training Hours** 102

AUTISM:COGNITIVE RESULTS PERCENTILE CHANGE



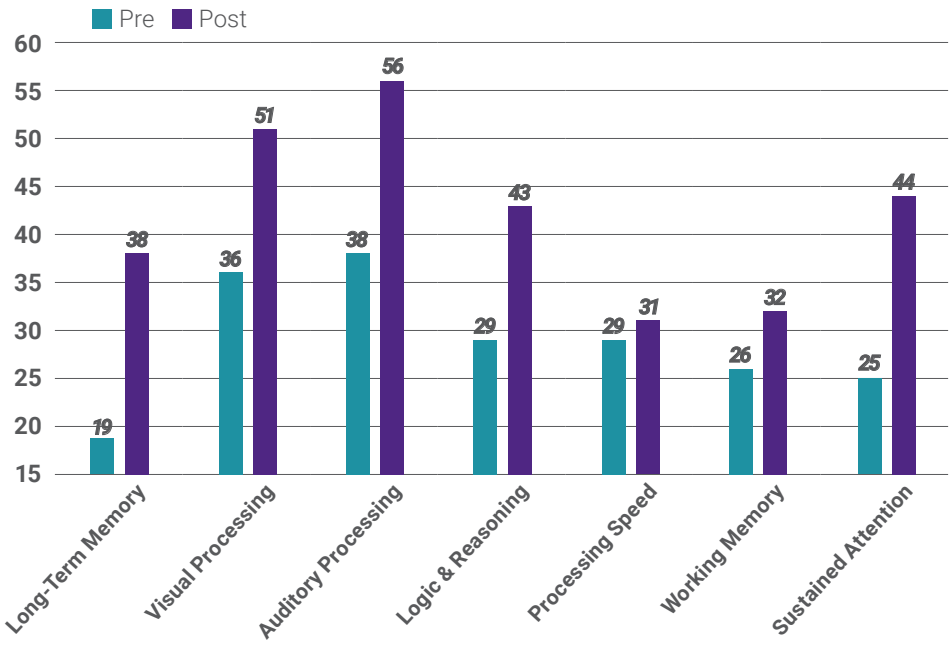
IQ SCORE CHANGE



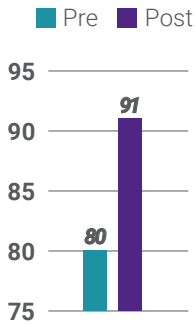
SPEECH & LANGUAGE | COGNITIVE RESULTS | ADULTS

Number of Clients 206 **Ages** 18-82 **Ave. Number of Training Hours** 98

SPEECH & LANGUAGE:COGNITIVE RESULTS PERCENTILE CHANGE



IQ SCORE CHANGE



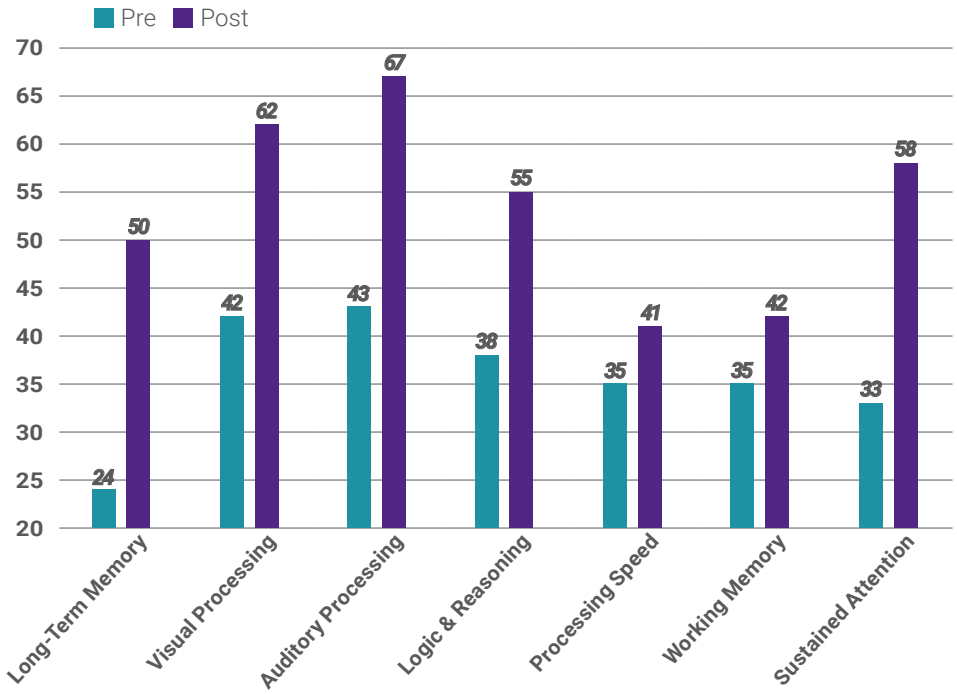
BrainRx®

Standard scores & percentiles on cognitive measures are aggregated across all test batteries; Changes in standard scores were statistically significant at $p < .001$ on all measures.

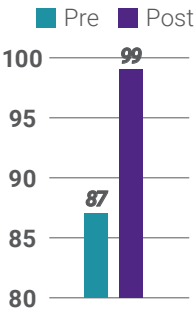
DYSLEXIA | COGNITIVE RESULTS | ADULTS

Number of Clients 323 **Ages** 18-71 **Ave. Number of Training Hours** 91

DYSLEXIA:COGNITIVE RESULTS PERCENTILE CHANGE



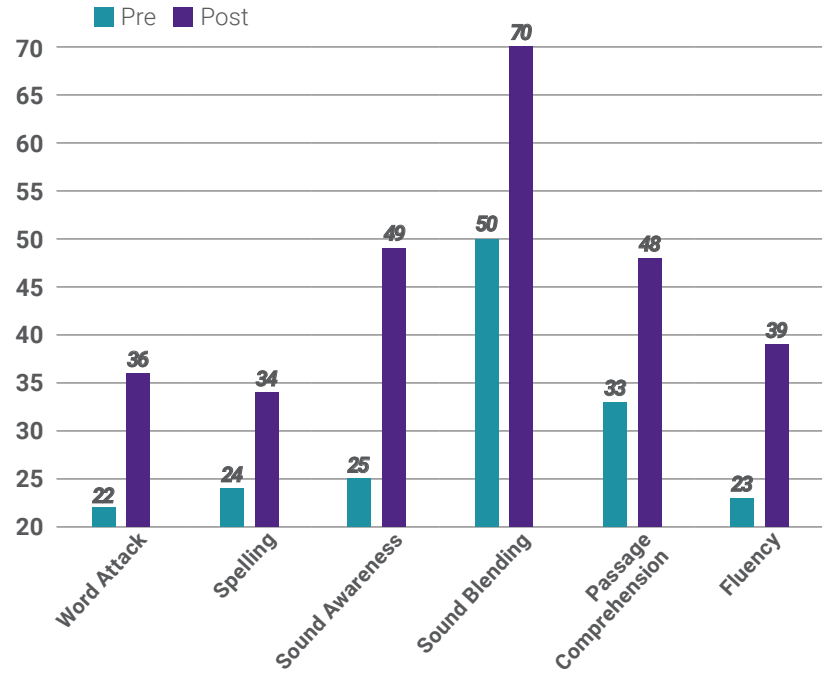
IQ SCORE CHANGE



DYSLEXIA | READING RESULTS | ADULTS

Number of Clients 323 **Ages** 18-71 **Ave. Number of Training Hours** 91

DYSLEXIA:READING RESULTS PERCENTILE CHANGE



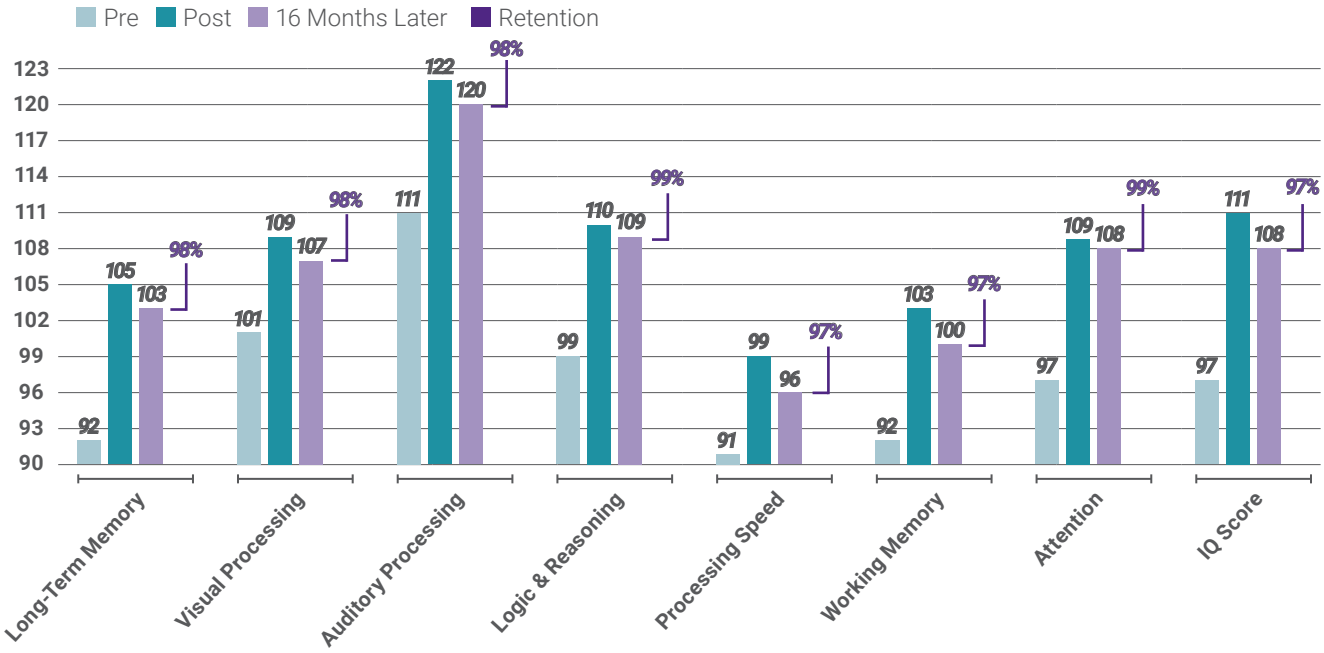
Standard scores & percentiles on cognitive measures are aggregated across all test batteries; Changes in standard scores were statistically significant at $p < .001$ on all measures. Reading subtests are from Woodcock Johnson Tests of Achievement.

BrainRx®

RETENTION RESULTS

- To assess retention of training gains for our clients, we analyzed the results for 2,383 clients who volunteered to return for a follow-up assessment an average of 16 months after completing a brain training program.
- Clients ranged in age from 5 to 80 with an average age of 11.2.
- Retention rates of post-training cognitive performance ranged from 97% to 99%, with the greatest retention of skills in attention and logic & reasoning.

STANDARD SCORES ON THE WOODCOCK JOHNSON III TESTS OF COGNITIVE ABILITIES

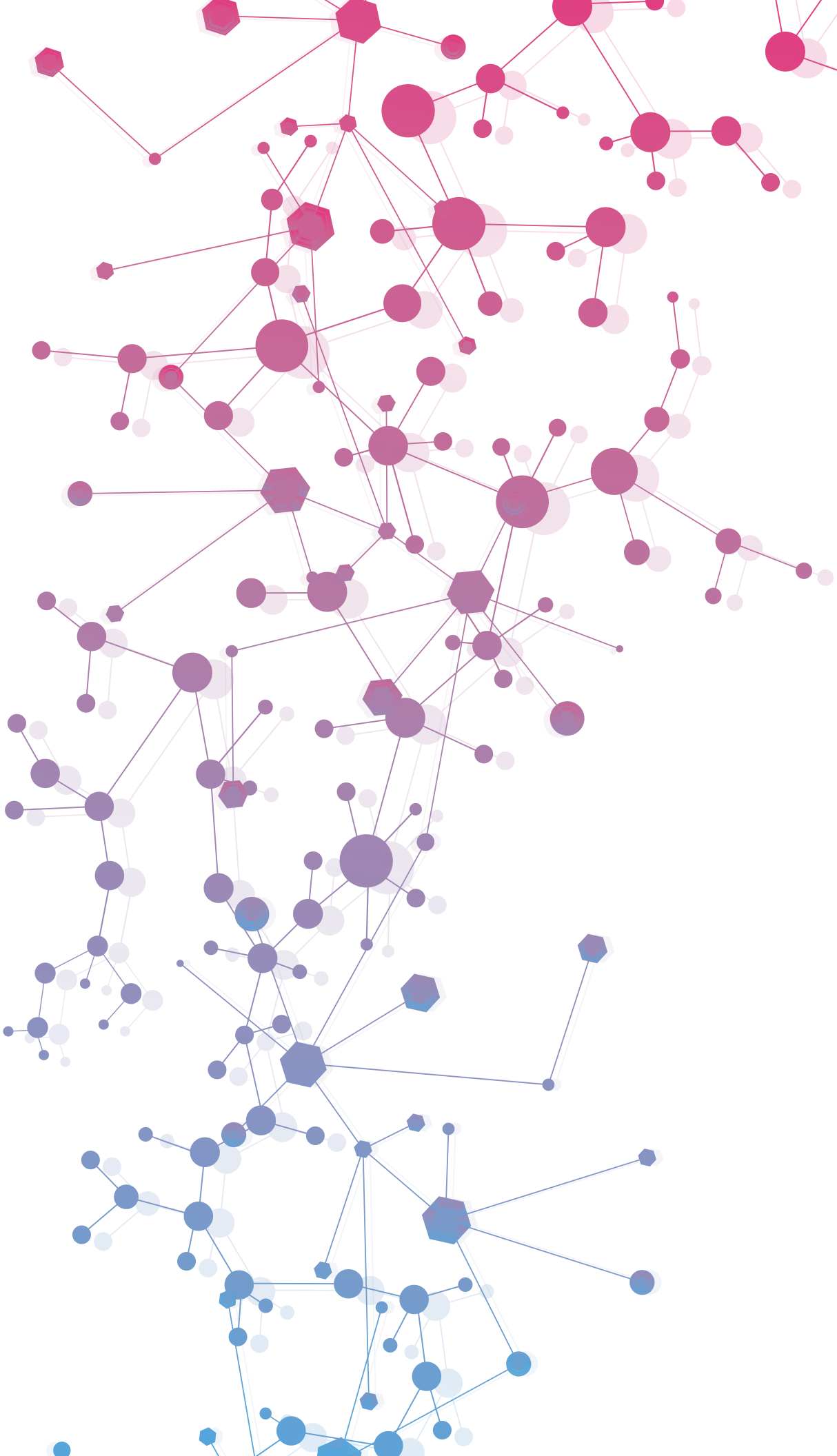


CLIENT SATISFACTION RATINGS

- To assess client satisfaction with our training programs, parents and adult clients are asked to complete an exit survey at the end of training. Between 2010-2022, 84% our 27,790 clients responded to the survey.
- In response to how likely they would be to recommend BrainRx to a family or friend, 97% of them said they were very likely or extremely likely to recommend BrainRx.

EXIT INTERVIEW RESULTS

QUESTION	TIMEFRAME	10	8 OR 9	7 OR BELOW	AVERAGE RATING
On a scale of 1 to 10, how likely would you be to recommend us to a friend or family member?	2019 - 2022	75%	22%	3%	9.6
	2010 - 2018	73%	23%	4%	9.5



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