LearningRx

Summary of Research

PEER-REVIEWED ARTICLES

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

This study with 178 students ages 5-18 investigated whether ThinkRx and ReadRx clinician-delivered cognitive training programs reduced academic difficulties and oppositional behavior for school-age children with learning struggles compared to a control group. Results indicated there were statistically significant differences overall between the intervention groups and the control group on all measures of academic difficulties. Both intervention groups saw a reduction in academic difficulty ratings following training while the control group saw an increase in academic difficulty during a comparable time interval. Both intervention groups achieved statistically significant changes on objective cognitive test measures as well. **Link to study**: https://www.frontiersin.org/articles/10.3389/feduc.2017.00062/full

Ledbetter, C., Moore, A.L., Mitchell, T. (2017). Cognitive effects of ThinkRx cognitive rehabilitation training for eleven soldiers with brain injury: A retrospective chart review. *Frontiers in Psychology, 8*(825). doi: 10.3389/fpsyg.2017.00825

The study examined the cognitive outcomes following ThinkRx, a clinician-delivered cognitive rehabilitation training program for soldiers recovering from traumatic brain injury (TBI) and acquired brain injury (ABI). In a retrospective chart review, we examined cognitive outcomes of 11 cases who had completed an average of 80 hours of ThinkRx cognitive rehabilitation training delivered by clinicians and supplemented with digital training exercises. Outcome measures included scores from six cognitive skill batteries on the Woodcock Johnson – III Tests of Cognitive Abilities. Participants achieved gains in all cognitive skills tested and achieved statistically significant changes in long-term memory, processing speed, auditory processing, and fluid reasoning with very large effect sizes. Clinically significant changes in multiple cognitive skills were also noted across cases. **Link to article:** http://journal.frontiersin.org/article/10.3389/fpsyg.2017.00825/full

Carpenter, D., Ledbetter, C., & Moore, A.L. (2016). LearningRx cognitive training effects in children ages 8-14: A randomized controlled study. *Applied Cognitive Psychology, 30*(5), 815-826. doi: 10.1002/acp.3257

In a randomized controlled study, the effects of a one-on-one cognitive training program on IQ, memory, visual and auditory processing, processing speed, reasoning, and attention for students ages 8-14 were examined. Participants were randomly assigned to either an experimental group

to complete 60 hours of cognitive training or to a wait-list control group. The purpose of the study was to examine changes in general intelligence and individual cognitive skills after completing cognitive training with ThinkRx, a LearningRx program. Results showed statistically significant differences between groups on all outcome measures except for attention. Implications, limitations, and suggestions for future research are examined. **Link to study:** http://onlinelibrary.wiley.com/doi/10.1002/acp.3257/full

Hill, O.W., Zewelanji, S., & Faison, O. (2016). The Efficacy of the LearningRx Cognitive Training Program: Modality and Transfer Effects. *Journal of Experimental Education: Learning, Instruction, and Cognition, 84(3), 600-620.* doi: 10.1080/00220973.2015.1065218.

This article describes two trials testing the efficacy of the LearningRx one-on-one cognitive training program and its computer-based version (Brainskills) in laboratory and school settings. Study 1 tested Brainskills in a laboratory setting with 322 middle school students. Paired t-tests revealed significant gains on all cognitive measures and math performance after 3 weeks of training. Study 2, a randomized control study, included 225 high school students randomly assigned to one of three conditions: LearningRx, Brainskills, or study hall (control) in a school setting for a 15-week training period. Univariate ANCOVAs revealed significantly higher scores for the treatment groups compared with controls on working memory, logic and reasoning, and three of four math attitude measures. **Link to abstract:** http://dx.doi.org/10.1080/00220973.2015.1065218

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.

The purpose of this study was to investigate the effectiveness of the comprehensive cognitive training program, ThinkRx. Sixty-one children (ages 6-18) were given pretest and post-test cognitive assessments. Thirty-one students completed a 24-week cognitive training program in a LearningRx center. A matched control group of thirty children did not receive training. Multiple regression analyses indicated that treatment group membership was a statistically significant predictor of outcomes in long-term memory, logic and reasoning, working memory, processing speed, auditory processing, and Word Attack. The treatment group realized significantly greater gains in six of seven cognitive measures. **Link to study:** http://www.covd.org/?page=VDR_1_2

Moore, A.L., Carpenter, D.M., Ledbetter, C., & Miller, T.M. (2016). *Clinician-delivered cognitive training for children with ADHD: Transfer effects on cognitive and behavior from the ThinkRx randomized controlled trial.* (Manuscript in second peer review.)

In a randomized controlled study, we examined the effects of a one-on-one cognitive training program on memory, visual and auditory processing, processing speed, reasoning, attention,

overall IQ score, and behavior for students ages 8-14 with ADHD. Results included greater pretest to post-test change scores on all variables for the treatment group versus the control group with statistically significant differences noted in working memory, long-term memory, logic and reasoning, auditory processing, and IQ score. Qualitative outcomes included far transfer to cognition and behavior as reported by participants, parents, and clinicians.

Moore, A.L., Carpenter, D.M., Miller, T.M., & Ledbetter, C., (2017). ***Transfer Effects from Two Methods of Delivering Cognitive Training to Children with Learning Struggles: A Randomized Controlled Trial.*** (Manuscript in peer review.)

In a randomized controlled trial assessing equivalence of parallel groups of children ages 8-14, we compared cognitive and behavioral outcomes between a group who received 60 hours of ThinkRx cognitive training delivered one-on-one by a clinician (n = 20) versus a group of children who received 30 hours of ThinkRx delivered by a clinician and the remaining 30 hours through digital training procedures (n = 18). Results showed no significant differences between groups on tests of working memory, logic and reasoning, auditory processing, visual processing, processing speed, or overall IQ score. Behavioral outcomes were similar between both delivery methods. These results suggest that both delivery models are efficacious interventions for children with learning struggles.

Moore, A.L., & Miller, T. (2017). Reliability and validity of the revised Gibson Test of Cognitive Skills, a computer-based test battery for assessing cognition across the lifespan. (Manuscript in peer review.)

This study evaluated the validity and reliability of the revised Gibson Test of Cognitive Skills, a computer-based battery of tests measuring short-term memory, long-term memory, processing speed, logic and reasoning, visual processing, as well as auditory processing and Word Attack skills. The sample for the study included 2,737 participants ranging in age from 5 to 85. Results indicated strong sources of evidence of validity and reliability for the test, including test-retest reliability coefficients ranging from .69-.91, split-half reliability coefficients ranging from .87 to .91, and concurrent validity coefficients ranging from .53 to .93. The Gibson Test of Cognitive Skills -2 is a reliable and valid tool for assessing cognition in the general population across the lifespan.

PEER-REVIEWED PRESENTATIONS

Moore, A.L., Ledbetter, C., & Carpenter, D. (2017). MRI and neuropsychological outcomes following cognitive rehabilitation training in traumatic brain injury: A Multiple case study. Presented at Society for Neuroscience, November 2017, Washington, DC.

Using a multiple case study design, we examined neural connectivity changes with fMRI and changes in IQ score, working memory, long-term memory, visual & auditory processing,

processing speed, attention, reasoning, and everyday functioning following 60 hours of cognitive training for 5 clients with Traumatic Brain Injury. Results from the Woodcock Johnson IV - Tests of Cognitive Abilities showed increases in IQ score for all cases (n = 5), with a mean increase of 21 points. All cases achieved gains in long-term memory, processing speed, logic and reasoning, and auditory processing; and four of five cases gained on visual processing and working memory. mTBI participants exhibited significant training-induced changes in neural connectivity. Normalization of the Default Mode Network (DMN) was evident in the severe TBI case along with the appearance of anti-correlations and decreased hyperconnectivity. Link to presentation

Moore, A.L., & Ledbetter, C. (2017). ***Beyond Attention: Memory and Processing Speed Deficits Dominate Cognitive Profiles in ADHD Across the Lifespan*****. Presented at American Psychological Association Annual Convention, August 2017, Washington, D.C.**

The objective of this study was to examine the cognitive profiles of a large sample of children and adults with Attention Deficit Hyperactivity Disorder (n = 5,417). We collected scores on the Woodcock Johnson III - Tests of Cognitive Abilities administered to children and adults with ADHD at 79 cognitive therapy centers between 2010 and 2015. Deficits were identified in comparison to the standardization sample as standard scores under the 38th percentile. Results indicated that although deficits in broad attention were present, there were even larger deficits in working memory, long-term memory, and processing speed. The results suggest that interventions for children and adults with ADHD should be aimed at not only the remediation of attentional difficulties but also at enhancing memory and processing speed. Link to presentation

Ledbetter, C., Faison, M.O., & Patterson, J. (2016). ***Correlation of cognitive training gains and resting state functional connectivity.*** **Presented at Society for Neuroscience, November 2016, San Diego, CA**.

In a randomized controlled trial, 30 high school students were randomly assigned to ThinkRx cognitive training (n = 11), Brainskills digital training (n = 12), or a control group (n = 7). Resting state MRI results showed training-induced gains in global efficiency associated with visual processing, auditory processing, contextual associations, the default mode network, and the cerebellum. For all seven cognitive skills measured, changes in resting state functional connections correlated with changes in performance on the test. **Link to** results

Moore, A.L., Ledbetter, C., & Carpenter, D.M. (2016). ***Intensive, metronome-based, 1-on-1 cognitive training improves cognitive skills in children.*** **Presented at Society for Neuroscience, November 2016, San Diego, CA.**

In a 2-phase randomized controlled trial, we examined the efficacy of ThinkRx cognitive training on IQ score, working memory, long-term memory, visual & auditory processing, processing speed, and reasoning for children ages 8-14 in a clinic setting. Then, we examined the

differences between two methods of delivering ThinkRx. Phase 1 training effects included significant pretest to post-test gains on all measures, and a mean gain of 21 points in IQ score for the trained group. Phase 2 training effects included significant pretest to post-test gains on all measures, and a mean gain of 22 points in IQ score for the second trained group. Pairwise comparisons only indicated a significant difference between the two delivery methods on long-term memory. **Link to** results

DISSERTATIONS AND TECHNICAL REPORTS

Moore, A. (2015). Achievement Outcomes for LearningRx Students: Math and Reading Achievement Before and After Cognitive Training. (Technical report.)

This study analyzed reading and math achievement outcomes for more than 6,000 students who completed a ReadRx or MathRx training program at LearningRx between 2008 and 2014. To assess differential effects of each program and to control for placebo effects, the ReadRx students served as the control group for the MathRx program and the MathRx students served as the control group for the ReadRx program. We measured the opposite skills from which the students were trained. The MathRx students made twice the gains in math and the ReadRx students made twice the gains in reading. In a subset of students who provided state reading achievement test results, 91% percent of the students who completed the ReadRx program showed improvement on state reading achievement tests after the intervention. See the results of the study.

Jedlicka, E. (2012). *The real-life benefits of cognitive training*. (Doctoral dissertation.) Retrieved from ProQuest Dissertations and Theses. UMI No. 3519139

Dr. Edward Jedlicka used an observational survey completed by parents to evaluate whether LearningRx brain training produced noticeable, real-life improvements in their children, especially in the areas of cognitive skills, academic success, and oppositional behavior. Both cognition and academic success increased significantly in those students who had completed a cognitive skills training program. Read the dissertation. *Associated manuscript was published in 2017.*

Moore, A.L. (2015). Cognitive trainer characteristics that predict outcomes for students with and without ADHD. (Doctoral dissertation.) Retrieved from ProQuest Dissertations and Theses. UMI No. 3687613

Dr. Amy Moore studied characteristics of 150 cognitive trainers that predicted outcomes for 1,195 clients with and without ADHD. After examining the predictive value of trainer personality, degree level, degree field, certification level, and pre-hire cognitive screening score

on client gains in long-term memory, working memory, processing speed, and general intelligence, she found that no trainer profile held practical significance. Dr. Moore concluded that the intervention itself may be more important than the characteristics of the person delivering it. Read the dissertation.

Pfister, B. (2012). ***The effect of cognitive rehabilitation therapy on memory and processing speed in adolescents.*** **Retrieved from ProQuest Dissertations and Theses. UMI No. 3553928**

Before and after scores of 1,277 adolescents were evaluated by Brian E. Pfister to determine whether LearningRx brain training improved working memory and processing speed. Based upon the results of this study, the gain in cognitive functioning as measured by working memory and processing speed in adolescents is statistically significant. These results support the use of CRT as needs based intervention in adolescents. Read the dissertation.

Luckey, A. J. (2009). ***Cognitive and academic gains as a result of cognitive training.*** **Retrieved from ProQuest Dissertations and Theses. UMI No. 3391981**

Dr. Alicia Luckey studied the impact of LearningRx brain training on GIA, memory, and reading in clients with ADHD, clients with dyslexia, and clients who were not reported to have any type of disability. Read the dissertation.

Ishanpara, P. D. (2013). ***Cognitive rehabilitation with LearningRx: Preliminary improvements in memory after traumatic brain inury.*** **Retrieved from ProQuest Dissertations and Theses. UMI No. 3574228**

Dr. Poonam Ishanpara analyzed the pre-test and post-test scores of 39 adults with traumatic brain injury (TBI). Her results indicated statistically-significant differences in long-term memory, short-term memory, and working memory after LearningRx training. Read the dissertation.

Moore, A. (2015). LearningRx Training and IQ Gains. (Technical report.)

This presentation reports the changes in IQ from before and after LearningRx training of more than 18,000 students between 2008 and 2015. The average IQ before training was 97 and the average IQ after training was 111, resulting in an average IQ gain of 14 points. The presentation also reports on a subset of 40 students with double baseline testing, revealing a decline in IQ between the time of diagnosis and beginning LearningRx training and then a dramatic increase in IQ following LearningRx training**.** See the results of the study.

Effectiveness of LearningRx Among Students in the Lowest Quartile. (Technical report.)

Doctoral Student Alicia J. Luckey, M.A., Educational Psychology, Arizona State University,

examined the effect of LearningRx training on 2,080 clients who completed programs in 2006. She focused on clients whose before-training scores fell in the lowest 25%. Read the report.

Independent Analysis of Test Results from 1,265 LearningRx Clients. (Technical report.)
Roxana Marachi, P.D., Assistant Professor, Department of Child & Adolescent Development at California State University, Northridge, analyzed the pre-training and post-training scores of 1,265 LearningRx clients who participated in the program in 2005. Read her analysis.

LearningRx Client Outcomes and Research Results: 2010-2015. (Technical report.)
Pretest and post-test scores of more than 18,000 LearningRx clients between 2010 and 2015 were analyzed. As a group, clients made statistically significant gains in all cognitive and academic skills measured by the Woodcock Johnson III Tests of Cognitive Abilities and Tests of Achievement. The average IQ gain was 14.9 points. Gains in cognitive skills ranged from 3.2 years to 5.0 years. Gains in reading skills ranged from 2.0 years to 6.3 years while gains in math skills ranged from 2.2 years to 3.5 years. Link to Client Outcomes and Research Results, 2016 Edition.

Ongoing Research:

Cognitive Training and Traumatic Brain Injury
*(*ClinicalTrials.gov NCT#02918994*)*

Cognitive Training and ADHD
*(*ClinicalTrials.gov NCT# 02917109*)*

Multidisciplinary Approach to Treating Mild Cognitive Impairment
*(*ClinicalTrials.gov NCT# 02943187*)*

Research updates and information available at www.GibsonResearch.org