lift BRAIN TRAINING

Statistical Analyses of the Congnitive Changes in Students due to the LIFT Brain Training Program

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Fabian Redler, Psy. D., L CSWDirector
What's On Your Mind, Inc. | Psychology-Learning & Brain Development

Analyses and Report by Brandi Viparina, MS
Overview background and procedure descriptions provided by What's On Your Mind, Inc.

Purpose of Current Report

The current report discusses the statistical analyses of the change in cognitive performance for students that have successfully completed the LIFT Brain Training Program. The cognitive processes of interest were the student's IQ, processing speed, memory, visual and auditory processing, and attention. Measures used included pre- and posttests of Woodcock-Johnson III Tests of Cognitive Abilities (WJ-III COG), Woodcock-Johnson III Tests of Achievement (WJ-IlI ACH), Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV), Test of Auditory Processing Skills (TAPS-3), Children's Memory Scale (CMS), and IVA+CPT Test.

Overview and Background of the LIFT Brain Training Program

The goal of the LIFT Brain Training Program (LIFT) is to assist students struggling academically in a way that goes beyond ordinary academic tutoring. LIFT wisely targets and strengthens the "brain muscles" responsible for how much and how well a student learns. Tutoring merely aims to improve academic deficits but fails to address the student's cognitive ability. By addressing the student's cognitive ability first, LIFT lays a foundation from which one can build the framework necessary to improve academic performance.

LIFT got its name from the fact that Learning Increases Faster with Training than any form of individualized tutoring. It was created to improve cognitive learning and processing skills ideally for children with learning disabilities. Those who can benefit from the program include high or average performers who want to perform mental activities faster, more efficiently, and even better than before, as well as below average performers who have learning difficulties. There are many children who struggle to learn even with adequate instruction. These are the children who most likely have a cognitive processing problem. They tend to:

- have trouble paying attention and staying on task
- become easily distracted
- reverse letters and words
- forget instructions or what was read earlier
- take a long time to complete a task
- keep making the same careless errors repeatedly without realizing it
- have difficulties sounding out words and spelling
- have problems creating mental pictures from a word math problem
- struggle to understand or comprehend what was read
- do things that don't seem to make sense

Each LIFT program is individualized to address the student's cognitive profile based on the results of an initial psycho-educational assessment. Based on the results of the assessment, a program is constructed to work his or her deficits with the related processing skills. Training the processing skills addressed by LIFT (i.e., attention, working memory, visual and verbal immediate memory, visual and verbal delayed

memory, visual processing, auditory processing, and processing speed) ultimately improves the student's IQ (intellectual quotient) and therefore increases the student's ability for academic success.

*For additional information about the LIFT Brain Training Program's purpose and development, please visit http://woym.net.

Descriptions of the LIFT Program

Each LIFT program is individually designed to strengthen a student's processing deficits. Students complete a LIFT program within fifty to sixty hours over a duration of 3 months, for approximately four hours per week in order to acquire significant cognitive gains.

Cognitive Measures

Prior to LIFT training, students must complete a comprehensive psycho-educational assessment as a pretest. After completion, students are assessed on 26 areas of cognitive and academic functioning according to the Woodcock-Johnson III Tests of Cognitive Abilities (WJ-III COG), Woodcock-Johnson III Tests of Achievement (WJ-lll ACH), Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV), Test of Auditory Processing Skills (TAPS-3), Children's Memory Scale (CMS), and IVA+CPT Test. These measures are considers reliable and valid. These tests strongly assess properties of cognition and academic performance and are administered by licensed psychologists. These measures were used to assess the following categories:

Categories	Test Used
IQ Standard Score	WISC-IV
Verbal IQ	WISC-IV
Non-Verbal IQ	WISC-IV
Working Memory	WISC-IV
Processing Speed	WISC-IV
Basic Reading Skills	WJ-lll ACH
Reading Comprehension	WJ-lll ACH
Math Calculation Skills	WJ-lll ACH
Math Fluency	WJ-lll ACH
Calculation	WJ-lll ACH
Math Reasoning Skills	WJ-lll ACH
Applied Problems	WJ-lll ACH
Quantitative Concepts	WJ-lll ACH
Visual-Immediate Memory	CMS
Verbal-Immediate Memory	CMS
Visual-Delayed Memory	CMS
Verbal-Delayed Memory	CMS
General Memory	CMS
Visual Processing	WJ-III COG
Auditory Processing	TAPS-3
Attention Quotient Full Scale	IVA+CPT Test

Attention Quotient Auditory	IVA+CPT Test
Attention Quotient Visual	IVA+CPT Test
Response Control Quotient Full Scale	IVA+CPT Test
Response Control Quotient Auditory	IVA+CPT Test
Response Control Quotient Visual	IVA+CPT Test

Below is a list of some of the brain/processing skills that are associated with learning which were measured in the pre- and post assessments:

- Working Memory: the ability to hold information just long enough to solve a problem. It is essential for mental math.
- Processing Speed: the speed at which the individual's brain is able to process information. It is related to the efficiency of thinking. The faster the processing, the more efficient the thinking.
- Math Calculation: the ability to compute basic math calculations including adding, subtracting, multiplying, & dividing.
- Immediate Memory (Short Term Memory): the ability to temporarily store and manage information required to carry out complex cognitive tasks such as learning, reasoning, and comprehension.
- Delayed Memory (Long Term Memory): the storage and fluent retrieval of information that is needed at a later time. It makes up the student's knowledge base.
- Visual Processing: the ability to process what is seen both externally and internally. Externally, the student must be able to process what is taught visually, while internally the student needs to be able to form clear and precise pictures of concepts. This is crucial for reading comprehension and math problems that rely on visual information.
- Auditory Processing: the ability to process what is heard including analyzing, blending, and segmenting sounds. Auditory processing is crucial for reading and spelling.
- Auditory Attention: attention used to listen.
- Selective Attention: the ability to focus attention on a specific task while disregarding distractions.
- Sustained Attention: the ability to stay focused for an extended period of time on a task that has little interest.

Demographics

The data set for the statistical analyses using the pre and the post measures WJ-III COG, WJ-III ACH, TAPS-3, CMS, and IVA+CPT included 7 students. The measure WISC-IV (i.e. Full, Verbal and Non-verbal IQ, processing speed, and working memory) included an additional 3 students, therefore assessing the scores of 10 students. Students included in the data were compiled from three main offices in the South Florida area. Ages ranged from 6 to 12 years old. Sixty percent of the sample was female.

LIFT- Cognitive Learning & Processing Skills (pre-/posttest differences)

In an initial analysis, the mean scores for each pre- and post-category are displayed in the histogram below (*Figure 1*). The scores were then matched with their classification (i.e. Average, High Average, Superior, etc.). The histogram shows a clear increase in scores from pre- to posttest scores.

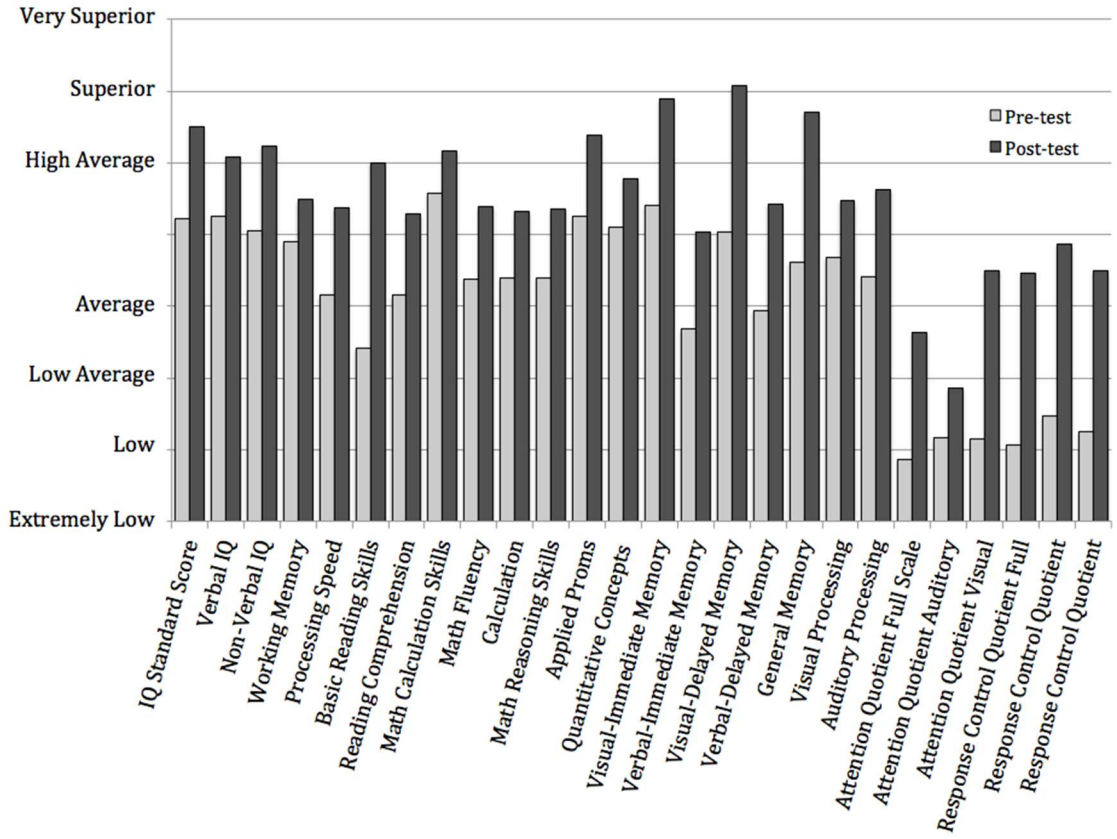

Figure 1. The mean score for pretest and posttest for all categories are matched with their respective classification.

The visual analysis was followed by a series of statistical analyses (i.e., paired sample t-tests). Results suggest that there were significant differences in most measures including, IQ (verbal and non-verbal), processing speed, visual and auditory processing, and memory. Most of these significant results were at a .0001 significant level, which means the result had a 1 in 1000 of a chance of occurring by chance alone.

Brain Skills	# of students	Average Pre-Test Score	Average Posttest Score	Sig.
IQ Standard Score	10	102.2	115.1	**0.0001**
Verbal IQ	10	102.6	110.8	**0.007**
Non-Verbal IQ	10	100.6	112.4	**0.005**
Working Memory	10	99	104.8333	**0.021**
Processing Speed	10	91.5	103.6667	**0.027**
Basic Reading Skills	7	84.1667	110	0.209
Reading Comprehension	7	91.5	102.8333	0.116
Math Calculation Skills	7	105.8333	111.6667	0.339
Math Fluency	7	93.8333	103.8333	**0.015**
Calculation	7	94	103.1667	**0.049**
Math Reasoning Skills	7	94	103.5	0.08
Applied Problems	7	102.5	113.9	**0.005**
Quantitative Concepts	7	101	107.8	**0.004**
Visual-Immediate Memory	7	104	118.8571	0.071
Verbal-Immediate Memory	7	86.8571	100.4286	**0.04**
Visual-Delayed Memory	7	100.4286	120.7143	**0.012**
Verbal-Delayed Memory	7	89.4286	104.2857	0.068
General Memory	7	96.1429	117.1429	**0.013**
Visual Processing	7	96.8571	104.7143	0.133
Auditory Processing	7	94.1429	106.2857	**0.0001**
Attention Quotient Full Scale	7	68.6667	86.3333	0.166
Attention Quotient Auditory	7	71.6667	78.5	0.694
Attention Quotient Visual	7	71.5	95	**0.01**
Response Control Quotient Full Scale	7	70.6667	94.6667	0.188
Response Control Quotient Auditory	7	74.6667	98.6667	0.169
Response Control Quotient Visual	7	72.5	95	0.161

The key results shown through statistical analysis is the increase in ability between the pre-test and posttest for the cognitive learning and processing skills that LIFT targets and strengthens (i.e. IQ, working memory, visual and verbal immediate memory, visual and verbal delayed memory, visual processing, auditory processing, and processing speed; *Figure 2.*). Therefore the results suggest a very strong indication that the brain-training program does specifically increase the processing skills related to academic success.

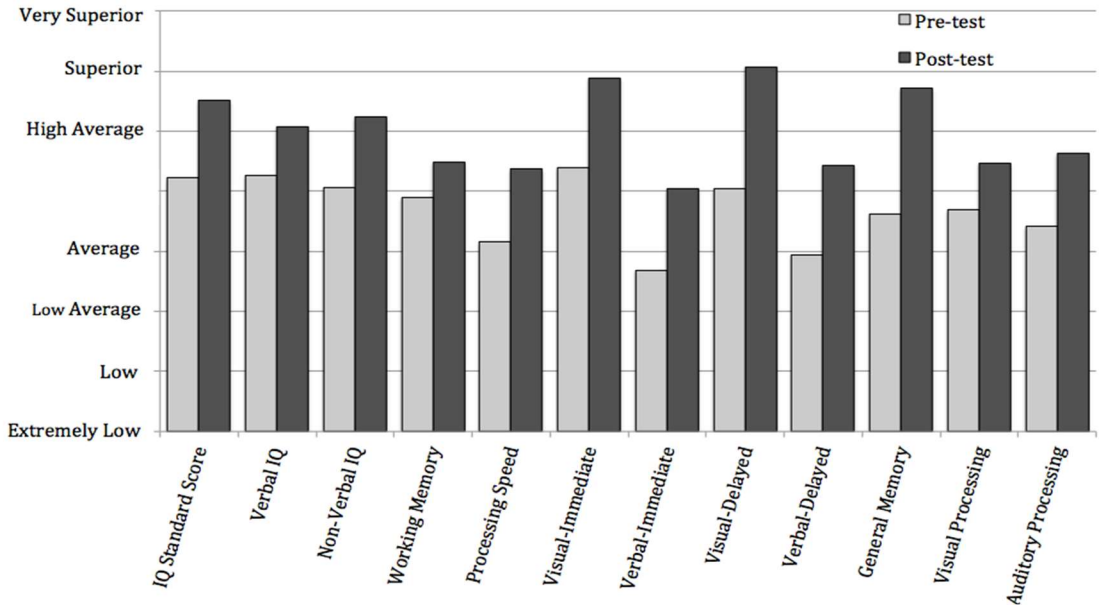

Figure 2. The main areas of processing skills pre- and posttest matched to respective classification.

Discussion of Limitations and Future Research

With regards to the processing skill of attention, a number of students in the sample with a diagnosis of Attention Deficit Hyperactivity Disorder (ADHD) were referred to the practice for the purpose of intervention after having received a comprehensive psychological evaluation from other psychologists. However, a continuous performance test such as the IVA+CPT, which measures the strengths and limitations of attention, were rarely included in these assessments. Consequently, most of the scores for these particular students had to be excluded from the current research because pretest scores were unavailable to compare with posttest scores. Due to the fact that a number of students previously diagnosed with ADHD were missing pretest scores for the attention categories, the number of students used for this report was restricted with regards to finding a statistically significant effect. However, when looking at the limited sample of students with ADHD that were able to be included in this report, there were clear improvements between their pre and posttest scores. Moreover the results suggest a trend in the right direction. Future research will be able to assess statistically significant gains in categories of attention as all students will be administered initial testing for attention thereby increasing the total sample size.

Conclusion

The main finding of the current report was the statistically significant increase in the cognitive learning and processing skills targeted by the LIFT Brain Training Program, moreover supporting the effectiveness of LIFT in exercising the brain skills responsible for learning and academic success.


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