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TWO DECADES OF EVALUATIONS

A CHANCE TO GROW

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INTRODUCTION

A Chance To Grow (ACTG) began in 1983 when a group of parents came together looking for better treatment options for their special needs children. What they wanted were ways to dramatically change their children's lives; what they needed were concrete ways to accomplish this ambitious task. And, these solutions needed to be *affordable, accessible* and *sustainable* over the long-term. This group of parents researched and evaluated interventions and consulted with specialists, bringing the most promising ones together in one place, creating ACTG.

Over the years, ACTG has evolved from a small agency providing home-based rehabilitation services for brain-injured and special needs children into a multi-service organization still providing clinical and rehabilitation services, as well as developing and testing brain-centered interventions in order to boost the learning and reading readiness of young children. ACTG operates an array of programs designed to help children achieve their full potential and centered on improving brain functions, improving early literacy skills, and addressing special needs of children.

In all of this work, ACTG followed a basic pattern:

- It stayed current with the latest research on brain development, brain-centered interventions, and special intervention methodologies (such as vision therapy, auditory methodologies, and recent work on autism).
- It developed and/or adopted interventions that produced measurable results.
- It applied these new interventions in clinical and classroom settings.

ACTG's work was unusual and noteworthy in two regards – its record of innovations and its commitment to evaluation:

- **Innovations:** ACTG has been an innovator in brain-centered applications to developmental problems and learning gaps, including:
    - The development of the SMART program to intervene with children with brain injuries and other special needs;
    - The introduction of the SMART program approach in elementary school settings, using the SMART intervention to improve early learning and reading;
    - The adaptation of the SMART curriculum for pre-school children and the introduction of SMART program in Head Start centers;
    - The use of neurofeedback, auditory stimulation, and developmental optometry to address specific challenges and as a support to learning.

- **Evaluations:** Over the years, ACTG staff developed considerable expertise in brain injuries and brain development and extensive experience in applying brain-based interventions under various conditions and real-life constraints. ACTG has searched for interventions and new technological developments that might compensate for initial brain-related limitations. It has used this experience in practical application to develop new methodologies designed to improve brain-related functioning and overcome cognitive delays or deficiencies. While ACTG initially focused on overcoming brain injuries and other developmental delays, it has spent almost as much time developing and applying its SMART brain stimulation interventions in various school and pre-school settings

  From the beginning, ACTG has made continual efforts to evaluate its interventions and to modify these approaches based on evaluative feedback – both in the form of formal evaluations and in the form of parental and teacher feedback. ACTG has completed over 30 assessments of its field applications of brain-centered interventions and their impact on learning readiness and early literacy skills. These assessments are of many different types – formal evaluations comparing SMART students to comparison students, measuring SMART results against national norms and/or grade-level proficiencies, measures of change or growth. The diversity of these assessments resulted from individual grant requirements, as well as variations in student assessments used in different schools. In some cases, adequate funding was secured for a relatively rigorous evaluation; in most cases, funding for evaluation was less than adequate and uncertain from year to year. As a result, the structures and rigor of the assessments were quite diverse[1]

The continual need to develop new funding sources for these programs (a problem made even more difficult by recent public budget cutbacks, economic crises, and shifting foundation priorities) precluded earlier efforts to summarize and/or categorize these many studies. However, this report will attempt to do just that – summarize past evaluations, as well as perform an informal meta-analysis on this collection of studies.

Why is it important to summarize this body of research? First, the lessons from these many assessments can get lost in the sheer volume of the work. Secondly, while we have witnessed a veritable explosion of brain research (most of it focused on mapping the internal workings of the brain), we still know relatively little about brain effects in practical settings, most especially

[1] The assessments differed in many respects: (a) Different Grade Levels – Head Start programs; Transition Kindergarten classrooms K-3 elementary grades; K-6 elementary schools.
(b) Different Geographical locations – Minnesota; Wisconsin; South Dakota; Iowa; Delaware; Tennessee; Georgia; Florida; Texas. (c) Various-sized schools and school districts – from large city schools to medium-sized cities to rural schools. (d) Different measures of reading levels and readiness – word recognition; auditory discrimination; reading fluency; phonemic awareness, word comprehension, alliteration, etc.. (e) Different test instruments – MRT6; SORT-R; Gates-MacGinnitie; Wepman; TCAP; Brigance Word Recognition; DRA; CBM Reading; IGDI. (f) Different Standards of Comparison: Statistical analyses; comparisons with normed distributions; comparisons with age-specific expectations. (g) Different Time Frames - most studies covered one academic year; a few more than one year; a few covered only a summer session. (h) Different Lengths of School Day – some Kindergarten classes were all-day; some were half-day.

early learning in schools. Thirdly, there are many assessments, and it is easy to get lost in the details. We have grouped these assessments in order to assist in sorting through the individual assessments. And, finally, the strengths of these studies is uneven. We have ordered the assessments from strongest to the less strong (a very rough categorization).

In another sense, this summary can serve as a case study of the struggles of a small nonprofit attempting to conduct evaluation research with limited and uncertain funding. When funding was relatively flush (at different times, federal, state, and foundation grants provided higher amounts of funding), more sophisticated evaluation was possible. But, it was more often the case that evaluation was done with inadequate funding. To a great extent, this explains the variability of the evaluations in this summary.

LEARNING READINESS AND EARLY LITERACY SKILLS

SMART (*Stimulating Maturity through Accelerated Readiness Training*) is ACTG's signature innovation and its major contribution to child development and early education. SMART is a brain stimulation program based on physical activities and movements designed to improve readiness for learning with a specific emphasis on early literacy skills. The SMART curriculum is organized around a variety of physical exercises, each designed to provide brain stimulation that promotes learning readiness. The SMART exercises focus on brain stem automatic functions, increase the speed of neural impulses by increasing brain myelization, and improve connections between brain hemispheres. Originally developed as a clinical model, for the past 2+ decades ACTG has adapted SMART for pre-school and elementary school classes and has three elements:

(1) Staff Training Workshops: In the summer before the introduction of SMART into a school, teachers and staff attend a multi-day workshop on brain development, the SMART curriculum, and suggestions on adapting SMART to the normal classroom on a daily basis.

(2) SMART Implementation: The SMART program is implemented by trained school teachers and staff who integrate the activities into daily schedules.

(3) Ongoing Mentoring by ACTG: On a regular basis, mentors from ACTG visit the school, monitor the implementation, coach the teachers, and solve problems.

Over the years, ACTG has conducted many evaluation studies in the attempt to demonstrate how and whether young children who receive SMART programming increase their learning readiness and early literacy skills. This section provides a summary of evaluations of SMART programming and its effects on learning readiness and early literacy skills.

The task of summarizing these 30+ assessments is challenging, as there is no clear way to group the work. Short of any best way, we have settled on the following groupings of studies:

- *Comparison group studies* – these are the strongest studies as the comparisons allow stronger conclusions to be drawn about the effect of the SMART program;
- *Follow-up studies* – these are important studies in that they assess whether the positive effect of SMART programming continues in following years;
- *Continuous testing in a charter school* – these assessments are important because they are done over eight years and because they compare results of white students and students of color;
- *Title 1 Schools* – Title 1 schools are designated as schools with high number of struggling students and with high numbers of students qualifying for free and reduced lunch

subsidies. These schools are of particular importance because of the interest in improving academic achievement for low income students.

- *Urban schools and urban school districts* – results from three individual schools in urban areas and results from two large urban school districts.
- *Single school studies* – results from single non-Title 1 schools from around the country.
- *Multi-school study* - aggregated results of students in 14 Minnesota schools
- *Mostly Native American schools* – three schools located near an Indian reservation in Northwest Minnesota

It should be noted that there is no unifying logic to these groupings. We have grouped similar studies in order to make it easier to understand. In some cases, a study is listed under more than one category, and we have identified these multiple listings with an red asterisk (*).

A. ***Comparison group studies:*** We start with those evaluations that were able to compare SMART classroom improvements/scores with that of comparable classrooms in the same school. Studies employing comparison groups provide the strongest and clearest indication of the effect of children receiving SMART. The following five evaluation studies involved comparisons of students receiving SMART with those not receiving SMART report strong positive results.

1. SMART Early Childhood Evaluation (2010): Over a three-year period, ACTG introduced SMART into Head Start pre-school classrooms in two sites (one rural and one metropolitan). Year 3 the results were striking (the first years of implementation produced inconsistent results primarily because of implementation difficulties and the time required for Head Start staff to get comfortable with the intervention). Using four indicators of learning readiness and cognitive development (IGDI and Brigance), the SMART Head Start preschoolers out-performed comparison group preschoolers on almost every comparison – at both sites. At the rural site, on 9 out of ten tests, the SMART children scores exceeded the comparison students; at the metropolitan site, the SMART children outperformed the comparison students on 8 out of 10 tests.

2. *Shingle Creek Transition Kindergarten Study (1989): Students in a full-day transitional kindergarten had already completed a year of regular kindergarten but failed to meet first grade readiness test requirements. So, they repeated kindergarten in a transitional year where they received SMART programming. At the end of the Transition Kindergarten year, children who received SMART scored significantly higher than comparison students on measures of early reading skills, school readiness, and auditory discrimination. Students who received SMART were reading at the 82nd to 89th percentile for students entering first grade. In other words, by the end of a year the SMART children who were at the bottom twelve percent of Minneapolis kindergarteners at the beginning of the year were performing in the top 20 percent of student going into first grade.

3. Rural Wisconsin Kindergarten (2002): At the end of the year, students receiving SMART and other students not receiving SMART were compared relative to national norms for that age group in Beginning Reading, Story Comprehension, and a Pre-Reading Composite skills on the MRT6. In each comparison, the SMART Kindergartener scores were higher at a statistically significant level.

4. Rural Wisconsin Kindergarten (2005): Kindergarten students receiving SMART scored significantly higher on Pre-Reading Comprehension of MRT6 relative to comparison students.

5. Rural Delaware 1st Grade (2005): Students who received SMART scored significantly higher on the Slossen Word Recognition test than comparison students.

One study using a comparison group reported *mixed results*.

6. *A Chance to Learn 1st Grade (1993): Improvement scores on Curriculum-Based Measure reading for students in a SMART program were statistically greater than improvement scores for comparison students. However, there were no significant differences in improvement scores on the vocabulary test and the comprehension test of the California Achievement Test.

B. ***Follow-Up Studies:*** In three evaluation studies, students who received SMART were followed for one or more years after completing SMART to assess whether reading gains were retained. Evidence that reading gains were retained in later years is strong.

1. SMART-Early Childhood Follow-Up (2010): One year after the last year of the SMART intervention in Head Start classrooms in rural Minnesota, a subset (N=45) of Head Start/SMART students were followed up after entering elementary schools (funding limitations precluded following up all children). Results of the Head Start/SMART combination yielded very positive results, especially given that the Head Start low income students were being compared to all students:

    - On tests of letter naming and sound fluency, the low-income Head Start/SMART students entered Kindergarten very close to the national norms for these tests.
    - Head Start/SMART students continued to learn in subsequent grades at levels expected of all students. Head Start/SMART students test scores in reading and math (MAP test) at the end of each of three grades (Kindergarten; First Grade; Second Grade) were compared with national norms. The students met or exceeded normative expectations at each grade level.

- Head Start/SMART students did not show any evidence of fading over time, and their growth scores at each grade level improved at the level of national norms, as well as at the level of other students in these grades.

2. *Shingle Creek Transition Kindergarten Study (1989): The Transition Kindergarten students who received SMART maintained their reading gains through the second grade. In contrast, over half of the students in the comparison group were still failing by the end of second grade.

3. *A Chance To Learn (: SMART 1st graders retained or improved their level of performance on the CAT tests through the second grade.

C. ***Continuous Testing in a Charter School:*** From 1994 to 2004, New Visions Charter School (Grades 1 thru 8) was affiliated with ACTG until separated. All students in New Visions participated in SMART programming (as well as receiving other needed special services). The great majority of the students were at this school because of past reading difficulties. From 1994 to 2004, reading testing was done each year for all students (Slossen Word Recognition and Gates-MacGinitie vocabulary and comprehension). The results are presented below. It is important to note that these gains were similar for children of color and white children, suggesting that SMART may play an important role in bridging a gap between racial groups.

NEW VISIONS CHARTER SCHOOL
1994 - 2005
Average Yearly Reading Gain

Year	Slossen Oral Reading Test			Gates-McGinitie Test		
	All School	White Students	Students of Color	All School	White Students	Students of Color
1994-95	1.5	1.4	1.5	1.1	1.3	0.9
1995-96	1.8	1.7	1.9	1.2	1.3	1.1
1996-97	1.6			0.9		
1997-98	1.1	1.1	1.1	1.0	1.2	1.0
1998-99	1.5	1.6	1.4	1.0	1.1	0.9
1999-00	1.8	1.4	2.0	1.2	1.3	1.1
2000-01	1.3			1.3		
2001-02	1.2	1.1	1.3	1.0	0.8	1.1
2003-04	1.4	1.1	1.5	1.0	1.1	1.0
2004-05	1.1	1.1	1.1	0.8	0.8	0.8
8 or 10 Yr Avg. Gain	1.4	1.3	1.5	1.0	1.1	1.0

D. ***Title 1 Schools:*** From the beginning, ACTG was particularly concerned about students struggling with reading (a foundational skill for later learning) and especially students from low-income families. Title 1 schools present a harder challenge. The following are summaries of results of SMART interventions in Title 1 schools from around the country (N = 7). Overall, the SMART results were positive for Title 1 students who present greater challenges.

(1) *Rural North Carolina (2006): Kindergarten students receiving SMART scored extremely high on end-of-the-year word recognition tests (Brigance) –the national expectation is 10+ words recognized. Over 90% of SMART students recognized 10+ words. The median number of words for SMART Kindergartners was 30+/-2. This level is higher than a score considered outstanding - 18-25 words. Similarly, 90% of 1st Graders and over 95% of 2nd Graders who received SMART scored above the 10 word threshold.

(2) San Antonio, Texas – 90 % Hispanic (2006 - 2008): At the end of the 2005-2006 school year and prior to beginning SMART programming, only 43% of Kindergarten students met or exceeded early reading skill proficiency levels. After one year of SMART, 85% of the next year Kindergarten students met or exceeded proficiency – more than double the previous year. One year later ending in 2008, another group of SMART Kindergartners kept up this high level of achievement.

(3) *Huron, South Dakota (2004): For Kindergartners, 78% performed above expectations on reading (DRA Word Recognition) and 97% on phonemic awareness; for 1st Graders, 71% scored above expectations on reading (MRT6) and 76% on phonemic awareness; for 2nd Graders, 75% scored above expectations on reading (MRT6) and 81% on phonemic awareness.

(4) Rural Wisconsin Grades 1 thru 3 (2005): In an analysis of MRT6 Word Recognition scores of 381 1st thru 3rd graders in Title 1 schools, the grade equivalent for word recognition increases approximately 1.5 years at each grade level so that by the end of 3rd grade, the students on average are one year ahead of grade level.

(5) *Knoxville, Tennessee Grades K thru 3 (2005): In 10 Title 1 elementary schools in an mid-sized urban setting, the percentage of SMART Kindergartner students who achieved proficiency in a word recognition test increased from 63% in 2002 to 80 percent in 2003. 2nd and 3rd graders had percentages of SMART students who scored at the proficient level in reading/language arts that equaled the state average, including African American and low income students. There were especially large increases in proportions of SMART students who achieved proficiency between Grade 2 and Grade 3.

E. ***Urban schools and urban school districts*:** Metro area schools and school districts present greater challenges because of the larger schools and bureaucratic school districts. Other issues such as higher concentrations of low-income students and greater racial diversity also play a role.

Three studies were conducted in elementary schools in metropolitan areas – one in San Antonio, Texas two in Minneapolis, Minnesota:

1) *In San Antonio (90% Hispanic), the results were positive, indicating that SMART improved early literacy.

2) *In one Minneapolis school, the results were also positive.

3) *In another Minneapolis school assessment, the results were mixed.

Two studies were conducted in metropolitan school districts, each including a number of elementary schools:

1) *In the Knoxville, Tennessee school district in over 40 schools, the findings were strong and positive that SMART improved early literacy.

2) In the Tallahassee, Florida school district (48 classes in 6 elementary schools), the findings were *mixed*.

F. ***Single school studies:*** The Minnesota Learning Resource Center has trained over 4700 teachers in 13 states. Some of the schools have reported evaluation results, mostly end-of-the-year test results. While these seven studies did not have the strongest designs, many reported surprisingly positive results.

1) *Huron, South Dakota (2004): Two Title 1 elementary schools introduced SMART for three years. Following three years of SMART, they reported that Title 1 school scores on the state's third grade test were on par with those in the school district's non-Title 1 schools – a result never achieved before.

2) *Rural North Carolina (2006): Kindergarten students receiving SMART scored extremely high on end-of-the-year word recognition tests (Brigance) –the national expectation is 10+ words recognized. The median number of words for SMART Kindergartners was 30+/- 2. This level is higher than a score considered outstanding - 18-25 words. These schools were identified as high fidelity schools, and these test scores are consistent with these judgments.

3) Clayton, Wisconsin Kindergartners (2005): In one of the rural Wisconsin schools (one where the implementation of SMART was exemplary and unusually consistent – high fidelity), all but one Kindergarten student out of 34 could read 10+ words from the Brigance word list by the end of the year.

4) Siren, Wisconsin – rural (2003): High percentages of Kindergartners had end-of-year reading readiness skills (MRT6) that were above the national average: Beginning Reading Skills – 70%; Story Comprehension – 77%; Pre-Reading Composite – 83%.

5) St. Ansgar, Iowa – rural (2005): High percentages of Kindergartners scored above the national average in end-of-year reading readiness tests (MRT6): Beginning Reading Skills – 75%; Story Comprehension – 77%; Pre-Reading Composite – 78%.

6) Lino Lakes, Minnesota (2004): For 1st Graders in three classes, 90% of students who received SMART programming scored above the national average on a test of phonemic awareness (Wepman Auditory Discrimination Test). Also, 85% of the SMART 1st Graders scored above the national mean for quick word recognition skills (Slossen-3).

7) Rochester, Minnesota 1st Grade (2011): One classroom of 1st graders did SMART daily throughout the school year, and their early literacy scores were compared to all other classrooms of first graders. By the end of the first half year, there were no differences in word recognition scores. However, by the end of the second half of the year, word fluency scores of the SMART class diverged significantly in the second half of the school year, resulting in substantially higher scores by the end of the year for the SMART children.

G. ***Multi-school study:*** A grant from the Minnesota legislature allowed ACTG to develop a state-wide effort to train a larger number of elementary school teachers in SMART and to provide regular mentoring to assure high fidelity in implementation in the schools. In 2001, the testing results from individual schools and classrooms in Minnesota were aggregated into a summary report on the relationship between SMART and early reading readiness.

Aggregated Results

1) Kindergarten End-of-Year Results (14 schools)

- Auditory Discrimination Readiness (Wepman): In Half-Day SMART classes (N = 2), 58% scored at the mature level; in Alternative Day, Full Day SMART classes (N = 3), 71% were mature; and in All-Day SMART classes (N=5), 58% were mature. For comparison classes (N = 2), only 27% were scored at the mature level.

- Sound Blending Readiness (Wepman): In All Day SMART classes (N = 4), 86% were rated at the mature level; in Extended Day SMART classes (N = 2), 84% were mature; in All Day SMART classes (N = 8), 94%

scored at the mature level. In comparison classes (N = 3), only 62% scored at the mature level.

- Words Read Basic List (Brigance): In Alternative Day, Full Day SMART classes (N = 2), the median number of words read was 12; in Daily All Day SMART classes (N = 1), the median number was 17. In the comparison class (N=1), the median number of words read was 2.

2) First Grade End of Year Results

- Oral Reading Rate (Curriculum-Based Measure): The 1st Graders had experienced two years of SMART (K and 1st). In 1st Grade SMART classes, the oral reading rate scores had a median of 84 words per minute, compared to a median of 57 words per minute for a comparison classes.

3) Second Grade End of Year Results (9 classes)

- Auditory Discrimination Phonemic Awareness (Wepman): There were only minor differences between students receiving SMART and students in a comparison class.

- Oral Reading Words Correct (Curriculum-Based Measure): SMART 2nd graders had a reading rate of 122 words per minute in comparison to a reading rate of only 101 words per minute for a comparison class.

H. ***Mostly Native American schools:*** Three studies were conducted in two schools with all Native American students and one school with high numbers of Native American students in Northwest Minnesota located within or on the border of an Ojibway reservation:

1) Naytahwaush - Grades K thru 2 (2000): Students from the school had previously posted extremely low scores in state-mandated basic skills tests. After a year of SMART, the Kindergarten class scored average for this grade level. SMART 1st graders (excluding special education and older students) scored somewhat above grade-level expectation. However, reading rates for 2nd graders were somewhat below grade-level expectations.

2) Ponsford – Single Kindergarten Class (2001): Scores on Phonemic Awareness (reading readiness) were at a level lower than expected for that age level.

3) Mahnomen - Two Kindergarten Classes (2001): Reading Readiness scores (auditory blending; reading familiar words; reading unfamiliar words) were higher than expected for this grade, but phonemic awareness skills ranged from average to below average.

VISION IMPROVEMENT

It has been estimated that vision problems are prevalent in about a quarter of all schoolchildren in the United States. And, this problem is even greater in school districts in disadvantaged neighborhoods or communities – children from poor urban areas experience more than twice the normal rate of vision problems. Vision is a critical prerequisite skill for reading and learning, although it is not often identified as such. A Baltimore study found that teachers thought the main problem with children referred to a learning problem clinic was lack of motivation, but further evaluation found that over 80 percent of these children had significant visual processing problems.

ACTG has found similar patterns. ACTG performed vision testing on two groups of children – inner-city transition Kindergarten students and a group of preschool children in a program in an affluent neighborhood. 66% of the 44 students in the ACTG program tested as having visual problems as compared to 5 percent of the children from the affluent neighborhood. In a Hopkins elementary school (inner-ring suburb of Minneapolis), ACTG was contacted by a Kindergarten teacher in an inner-ring suburban school (mixed-income). The teacher felt that, as compared to previous years, many more students in this year's class were struggling – were "low" in her words. After Telebinocular vision testing, ACTG found that 52% of these students had vision problems.

In its search for more effective reading interventions, ACTG discovered Developmental Vision Therapy. While developmental optometry has a long history, it is just recently gaining wider acceptance (for example, the Mayo Clinic now uses developmental vision therapy). Developmental optometry has developed exercises to strengthen visual pathway skills, such as focusing, eye teaming, seeing in depth, etc. As a result, ACTG has been operating a developmental optometry clinic to provide individual vision therapy for children with special needs and for children struggling with reading in school. Children with complex visual perceptual problems are referred for one-on-one developmental vision therapy. ACTG's optometry clinic tests children for visual efficiency and perceptual skills, as well as acuity.

It is a common observation that about 80 percent of what you learn in a classroom is through the visual pathway. However, individualized vision therapy is not usually feasible for economic reasons, especially for those children from low-income families. ACTG searched for ways to implement vision therapy exercises in a classroom setting in public schools. It adapted a variety of developmental optometry activities into its SMART curriculum that is delivered to groups of children in classroom settings.

- New Vision School (2005): Seventeen students were judged to need vision therapy based on failing the vision screening in the Fall. These students received vision therapy in addition to SMART programming. The percentage of students passing 5 vision skills after receiving vision therapy increased by an average of 45%. In addition, a total of 128 students in Grades 1 thru 5 were administered development vision testing in the Fall and

then, after receiving a year of SMART programming, were tested again in the Spring. In terms of the percentage of students passing the 9 developmental vision tests, the average percent of improvement of vision skills from Fall to Spring was 22 percent (range = 5 to 34 percent).

- A Chance To Learn (1993): After a year of SMART, vision scores (Keystone Telebinocular Test) improved significantly more than the vision scores of comparison school students. ACTG students who scored higher on the Keystone Telebinocular Test scored higher on vocabulary test and a reading comprehension test (California Achievement Test) than students with lower vision scores.

- MLRC Statewide Results (2001): There was no difference in Near-Point Eye Convergence Visual Readiness between SMART 1st Graders and comparison students.

SPECIALTY SERVICES

A Chance To Grow also offers specialty services for children who need specific and more intensive interventions for developmental needs. Again, the assumption is that addressing some of these special challenges will better equip the child for improved learning in the classroom.

A. **Neurotechnology and Audio-Visual Entrainment (AVE)**: ACTG uses EEG neurofeedback and light-sound stimulation to help children correct and control impulsive and distracted behaviors.

- Joyce and Siever article in Journal of Neurotherapy, (2000),vol. 4(2): Thirty-four elementary students from two different schools were referred for AVE intervention for an average of 31 sessions lasting 22 minutes. A comparison of pre-and post-test scores on four indicators of impulsivity and attention (the Test of Variables of Attention – TOVA) found three to be statistically significant. In addition, a subsample of eight students from one of the schools were tested before and after AVE on the Standardized Test for the Assessment of Reading (STAR). Students with AVE gained significantly more on reading scores that a non-AVE group of students from the same class.

- MLRC Statewide, Grades K-11, 7 schools (2001): In addition to SMART programming, students in these schools who were diagnosed with the learning challenges of inattention, impulsivity, and hyperactivity were selected to receive Neurofeedback and Audio-Visual Entrainment (AVE):

    - Behavioral Improvements: Both teacher and parent ratings of four behavioral dimensions (Anxiety; Depression; Hyperactivity; Inattention) were gathered in the Fall and Spring. There were significant improvements for both teacher and home ratings of each of the four behavioral areas.

    - Changes in Oral Reading Scores (Slossen-R): On average, students gained 8 months in grade-equivalent oral reading scores (pre and post-test comparisons, $p < .001$).

    - Minnesota Schools (2006): 50 students with emotional disorders indicative of ADD or ADHD in eight Minnesota schools were nominated by teachers and special education staff to receive an average of 43 sessions of AVE. As reported by teachers and students, there were moderate reductions in anxiety symptoms and ADHD-related behaviors at the end of the year.

B. **Hemispheric-Specific Auditory Stimulation (HSAS)**: HSAS sharpens auditory discrimination skills, which aid in the acquisition of phonics skills, processing verbal instructions, and development of social skills. Children listen to individually formatted music designed to stimulate under-developed auditory processing.

- Cold Spring, Minnesota (2003): A rural elementary school implemented SMART along with two supplementary special services provided by ACTG – HSAS and neurotechnology. By 2nd Grade, the school was able to graduate seven students from Early Childhood Special Education – a savings of $35,000 per year.

- Minnesota Schools (2001): 80 students in eight elementary schools throughout the state (2 suburban and 6 rural), the majority of whom were diagnosed with a Specific Learning Disability, received HSAS programming. First-year HSAS participants demonstrated improved auditory processing; second and third year HSAS students showed even greater improvements. In addition, all students made reading gains.

- Fairmont (206): 20 students (Grades 2 thru 5) who were struggling with reading and whose screening indicated eligibility received HSAS for 20 minutes per day for five days a week (50 total hours). The students made impressive gains from Fall to Spring on each of four subtests of SCAN-C and the Word Discrimination Subtest of TAPS-R. Moreover, these students made even more impressive NWEA Reading test gains over the academic year - 2nd Grade students (N = 6) made an average of 2 years growth; 3rd Grade students (N = 3) made an average growth of 1.3 years; 4th Graders (N=6) an average of 4.6 years growth; and 5th Graders made an average of almost 3 years growth.

- Fairmont (2008-2010): Twelve 1st and 2nd grade students receiving HSAS over a two-year period showed significant improvement in four out of five early reading skills subtests – word discrimination (TAPs-R); filtered words, auditory figure ground, competing words (SCAN-C). There was no difference in improvement on the competing sentences subtest of SCAN-C.

COMMENTARY

Richard Nathan[2] has aptly observed that "the American political system concentrates most of its attention on deciding what to do and not much on how to do it." The same can be said for the recent and growing political support for early childhood development. While the attention given to brain development and learning in preschool and early elementary grades is encouraging, most of this attention focuses on the need for early education funding and not much on "how" to improve early education. ACTG and its SMART interventions are an important part of understanding "how" to do early childhood education.

The two most important and positive comments about ACTG's evaluations of SMART are:

1. The volume of the evaluations: In my more than thirty years of work in program planning and development, research and evaluation, and community development, I have never witnessed such a large number of program evaluations in a small nonprofit. It is a record of assessment that is to be envied in its volume and is a credit to A Chance To Grow (this is not to say that all of the assessments were of the same quality nor did they all live up to my expectations about adequate methodology). I have never come across such a consistent and long-term commitment to evaluation. More of this should be encouraged; however, this does not happen usually because of lack of funding.

2. The consistency of the findings: The second important observation is that, while many assessments were done, the positive findings are very consistent across studies, across schools, across geography, and across grade levels. However, it must be kept in mind that many of these positive findings occurred without an adequate comparisons and , so, are difficult to interpret.

The quantity and consistency of research findings lend strong support for the potential of A Chance To Grow's brain stimulation work. Two positive comments on research quality are pertinent:

1. The importance of evaluations with built-in comparisons: Given all of the noise present in applied research settings, the value of assessments with comparison groups cannot be over-stated. That is why is the organization of the assessments in the report, those with comparison groups were given prominence by being listed and described first. As we all know, the opportunities to find/develop comparison students with some modicum of comparability are limited by cost, school constraints, contamination threats, and concerns about keeping some students from receiving an intervention. The fact that ACTG was able to conduct six studies with comparison students is to their credit, but even more of this type are needed.

[2] Former Assistant Director of Management and the Budget in Washington and former Director of the Rockefeller Institute of Government at the State University of New York.

2. The value of follow-up studies: In three cases, ACTG was able to track the positive outcomes of SMART beyond the time of the intervention – one to three years subsequent. These are important tests of the strength of the intervention. Again though, the ability to follow up SMART interventions beyond the funding period is limited by cost constraints and by complications in gaining access to school data bases.

Now, for a few cautionary remarks:

1. I worry a bit that the volume and consistency of positive findings will lead to glib interpretations. It is important to constantly remind ourselves that educational interventions are far from simple and straightforward – they are, in fact, quite complex. The number of factors that can intervene between intervention and outcome can create noise that confounds interpretation – including making it hard to discern positive results (it could be that the relationship is even stronger than applied research can demonstrate). This is an especially important caution with those assessments in which a control or comparison group was not possible.

2. There is also the danger of believing that one intervention, in this case SMART, can make tremendous changes in academic outcomes – and this becomes even more problematic the greater the time difference between intervention and outcome. This is a mistake frequently made in return on investment studies of early childhood education.

3. The *design* of an intervention is not the same thing as the *implementation* of an intervention. This is especially true in applied settings and in the school settings where the actual SMART interventions are done by many different teachers/staff. And, since it is difficult to assess fidelity of implementation, it may be that the actual effects are muffled by this variability.

A comment on program evaluation is in order. While there is widespread rhetorical support for program evaluation (to the point where it is almost universally required as part of a grant or contract), this rhetorical support is not often supported with adequate financing. Without adequate financial support, we will be left with evaluations that are weak, precluding more definitive judgments about program effectiveness.

It is also important to note that it is difficult to undertake educational innovation in public education in America. Businessmen and economists are wont to say that investments are not likely to occur in an environment of uncertainty. . The same might be said of educational innovation. For decades, educational policy and priorities at the national, state, and local levels has been anything but consistent. Going back to the 1950's, there has been one or more educational priorities eachdecade – funding for science as a response to Sputnik, school desegregation policies, A Nation at Risk, graduation standards, teacher accreditation, charter schools, school reforms, No Child Left Behind, and ever-increasing mandates for standardized testing. And, an even greater degree on discontinuity is created by the variety of decision-makers affecting school operations – federal government, state departments of education, Superintendents and school districts, and school Principals. It is no wonder that educators feel

that they are in a constant whirlwind and are constantly being jerked from one educational fad to another. And, it is a state of uncertainty that makes innovation difficult, especially when it comes to introducing new approaches when schools face so many mandates and to sustaining innovations in the face of the latest fad.

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