Retraining Cognitive Abilities:
A Report on Thinking and Memory Improvement
Applying Suggestopedia and Cognitive Behavior Modification (CBM)
for Ages 10-55

Part II: A Longitudinal Study

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Abstract.

This article reports Experiment II, or the longitudinal one to three year post testing of Experiment I, which was published in the last issue of SALT (14, (1), Spring '89). Longitudinal data is often difficult to obtain. Not only are individuals difficult to locate years past the time of a treatment project, but many are unwilling to go through a third testing procedure for scientific purposes. Unless the individual can see pertinent information relevant to their needs, follow-up post-testing can be difficult, if not impossible to accomplish. Some of the individuals reviewed in this article received the treatment as long as eight years ago. The follow-up case histories, therefore, have required development time.

This study explored how a specific application of information processing theory was put into practice using **Cognitive Behavior Modification (CBM) methods (Meichenbaum, D., 1977), and Suggestopedia methods (Lozanov, G., 1978), by applying Kaufman & Kaufman's (1983) Sequential-Simultaneous Dichotomy, within the Guilford (1967) Structure of Intellect Model.** The previous article went into theoretical detail describing the operational form of this construct.

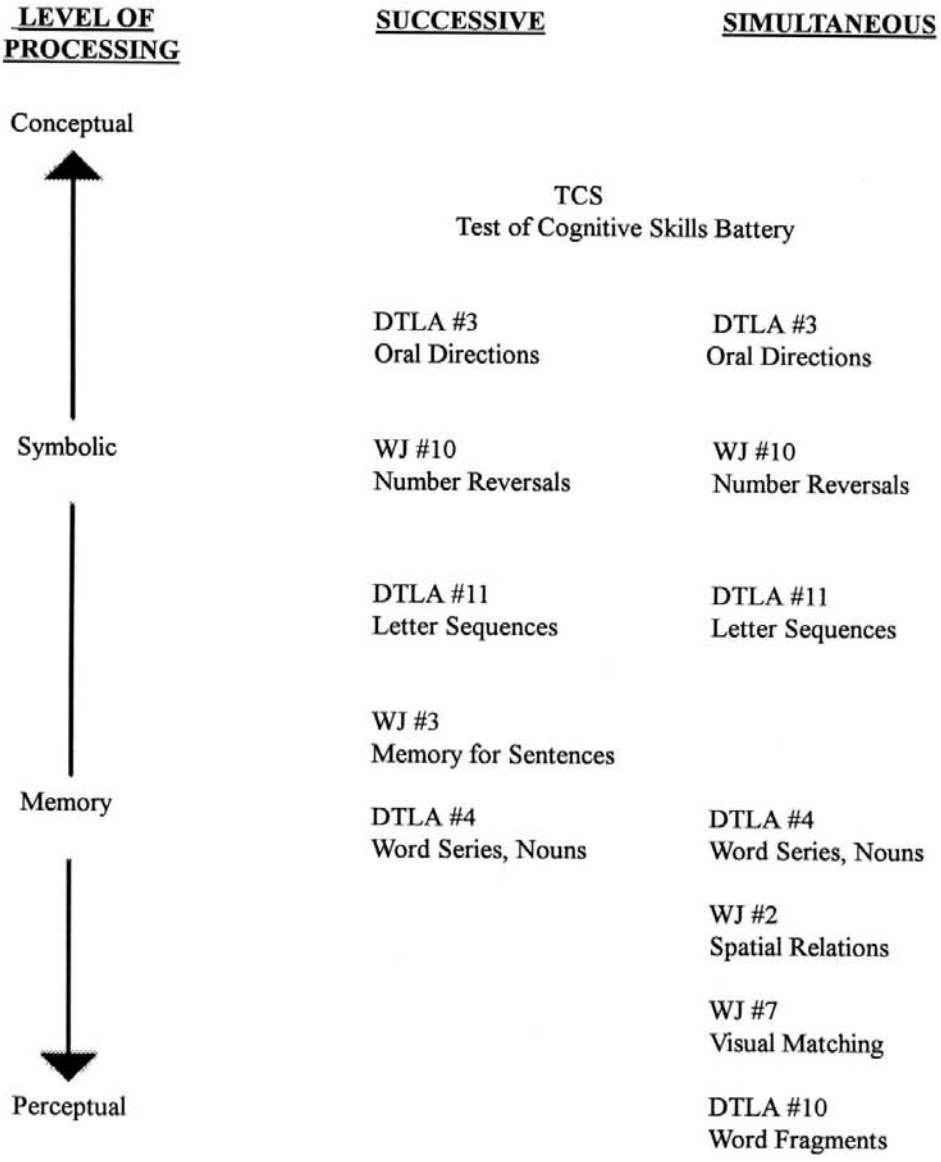
Experiment II was conducted to determine if gains achieved in a three-week application were maintained longitudinally. The subjects ranging in Experiment II ranged in ages from 10 to 24, with one adult age 55, and the number varied from 31 to 40.

Six subtests were given from the Detroit Tests of Learning Aptitude-1 (DTLA-1) (Baker, H. & Leland, B. 1935; 1967) measuring simultaneous and sequential components. This particular battery was administered before the revision of these tests was available (DTLA-2, Hammill, D., 1985). These subtests were selected according to the information processing theory construct (Johnson & Myklebust, 1967), Woodcock's (1978) level of processing theory, and to support Kaufman & Kaufman's (1983) Sequential-Simultaneous Dichotomy (see figure 1).

Through standardized testing, information processing deficiencies and weaknesses along this hierarchy line (see Figure 1) can be identified and pinpointed for corrective purposes.

The research question was: Can specific cognitive abilities be isolated and retrained, with the results maintaining over a period of time?

figure 1



TCS = Test Cognitive Skills, Sullivan, Clark, and Tiegs, 1981
Based upon the California Maturity Scales
DTLA-2 = Detroit Tests of Learning Aptitude, Hammill, 1985
WJ = Woodcock Johnson Psycho-Educational Cognitive Skills Battery,
Woodcock and Johnson, 1978, 1989

Based upon Johnson & Myklebust's information processing hierarchy theory (1967), and adapted from Woodcock's level of processing theory (1978).

Method

Subjects

Experiment II, consisted of a group of 40 experimental subjects, ages 10 to 24, with one adult age 55. They ranged from gifted to severe deficit classifications, including low average, learning disabled, and mentally deficient. They returned for testing for a one- to- three-year longitudinal follow-up to determine if gains had permanent effects. These individuals had voluntarily enrolled in the original three-week program (1 hr. 15 minutes per day), to improve memory and information processing. Fifteen students were classified by public and private schools as learning disabled, two were classified as developmentally disabled, and three were classified as gifted. The remaining nineteen students ranged through low average, average, and high average in school. The forty students were primarily from a middle income environment. This experiment did not have a control group.

The purpose of the study was to analyze the effects of the treatment longitudinally, determining whether the treatment results were maintained, within a wide range in age and ability levels. Follow-up delayed post testing took place one to three years following the treatment.

Class Grouping Procedure

The forty subjects were assigned in small groups of two to four individuals according to age and entry ability, which was determined in a pre treatment screening and testing interview. The subjects were pre-tested using three subtests from the Detroit Tests of Learning Aptitude (DTLA-1) (Baker & Leland, 1935;

1967). These were: No. 06 (Memory For Unrelated Word Sequences), No. 16 (Memory For Letter Sequences), and No. 18 (Following Oral Directions). The age compatible individuals were placed into groups according to their scores on these tests, along with their perceived personal capability aspects, as evidenced by their school's report card grades.

Materials/Tests For Experiment II:

Six subtests were selected from the DTLA-1, (Baker & Leland, 1935; 1967), a testing battery designed to measure perceptual processing in visual and auditory sequential memory and integration, and visual simultaneous memory. These subtests were administered pre treatment, and post treatment following the three weeks of instruction. Four subtests were selected to measure Successive Processing, and three subtests were selected to measure Simultaneous Processing (Kaufman & Kaufman, 1983). These authors define Successive Processing as the ability to handle stimuli in sequential or stepwise fashion. Simultaneous Processing includes the input of stimuli with its simultaneous synthesis into a gestalt formation. The four subtests measuring Successive Processing were: No. 06 (Memory For Unrelated Word Sequences); No. 13 (Auditory Memory For Sentences); No. 16 (Memory For Letter Sequences); and No. 18 (Following Oral Directions). The three subtests measuring Simultaneous Processing were: No. 09 (Visual Memory For Figures); No. 16 (Memory For Letter Sequences); and No. 12 (Visual Memory For Spatial Designs). At the conclusion of the three week treatment period, post testing procedures identical to the pre treatment testing were administered. Identical longitudinal post testing was then administered to the

forty, thirty-four, and thirty-one subjects one to three years following the treatment period.

Additional longitudinal standardized intelligence and aptitude testing was administered in as many cases as possible, to cross validate the mental age scores measured by the DTLA-1. These intelligence and aptitude tests were: DTLA-2 (Hammill, 1985), Short Form Test of Academic Aptitude (Sullivan, E. T., Clark, W. W., & Tiegs, E. W., 1970), Slosson Intelligence Test (Slosson, R. L., 1982), the Wechsler Intelligence Scale for Children (Wechsler, D., 1949), and the Woodcock-Johnson Psycho-Educational Battery (Woodcock, R. W. & Johnson, M. B., 1977). Pretest and posttest scores were also correlated with private and public school testing when available.

The DTLA-1 interprets intelligence scores in terms of mental age, and uses median point scores. Earlier 1980s psychological measurements determined intelligence by dividing chronological age into mental age scores.

With mental age scores (M. A.), a person with average intelligence should earn a score that equates his mental age with his chronological age (C.A.). Therefore, the M. A. score should equal = the C.A. score to have an average intelligence. Mental age scores are reported with two numbers separated by a decimal. The first number is the age in years, the second number is additional months in age. For example, age 7.6 means seven years and six months. Each month in a person's life, up to age nineteen, is important in terms of developmental growth. Therefore, even a two- or three- month gain is significant. If the mental age number is significantly below the chronological age number, it means that there is a considerable processing deficiency.

Training Procedure for Experiment II:

The treatment procedure, and the adjunct media applications, were the same for Experiment II, as for Experiment I.

This information on training application was published in the last issue of SALT (Vol. 14, #1, Spring 1989). This included an abilities and academic outline, and an explanation of how Suggestopedia and Cognitive Behavior Modification techniques were applied with lesson plan formats.

Results:

Table 1 illustrates the Means and Repeated Measures for six Dependent Variables for Experiment II. Four subtests were administered to measure successive processing (Kaufman & Kaufman, 1983), three of them to 40 individuals, and the fourth subtest to 31 individuals. Two additional subtests were administered to measure simultaneous processing, one to 31 and the other to 34 subjects. All six post tests were significant at the $<.01$ level. All of the scores were converted to raw scores for comparative purposes. Referring to the patterns of the pre tests, post tests, and delayed (1-3 yr.) post tests means, it was concluded that significant gains were made from the pre test to the immediate post test. Gains held steady from immediate posts to delayed (1-3 yr.) post tests. This indicates that simultaneous and successive processing improvement was maintained over a period of time.

On DTLA subtest No. 18 (Following Oral Directions), there was a slight regression from post test to delayed (1-3 year) post test. The delayed post score was significant at the $p<.01$ level, indicating permanent retention of learning strategies leading to improved auditory-visual integration.

Two subtests measuring simultaneous processing (Visual Memory for Figures, DTLA No. 9, and Visual Designs, DTLA No. 12) were administered to 31 and 34 subjects respectively. Both of the subtests scores were significant at the $p < .01$ level.

Table 1.

Means and Reported Measures

for 6 Dependent Variables

for One to Three Year Longitudinal Post Testing

Subtest #		# Ss	Total Raw Pts. Pre	Post	1-3 Yr. Post	Wilks Lambda	F Ratio	df
Successive Processing								
Aud Mem Words	06	40	69 50.58	58.90	59.13	.19	81.01*	2,38
Vis Mem Letters	16	40	67 45.55	54.40	54.68	.29	46.80*	2,38
Oral Directions (Vis - Aud) (Integration)	18	40	40 15.38	29.13	27.78	.17	95.54*	2,38
Aud Memory Sentences	13	31	123 69.03	89.06	89.39	.22	52.09*	2,29
Simultaneous Processing								
Vis Memory For Figures	09	31	65 50.39	62.87	61.94	.17	72.47*	2,29
Vis Memory For Designs	12	34	44 34.85	42.12	42.50	.34	31.66*	2,32

*sig $< .01$

Pre, Post, and 1 - 3 Yr. Post scores are all tabulated in raw points

Subtests are from The Detroit Tests Of Learning Aptitude -1; Baker & Leland, 1935; 1967

Case Histories Of The Longitudinal Data:

It was my intention to review the best and the least successful in each of the categories, gifted, high average functioning, below average functioning, learning disabled and developmentally disabled. Of the forty subjects, all were either attending school or were successfully employed. Significant cases in each category have been reviewed.

Gifted

B. H. took the class when he was age 12.7, a sixth grader in the public schools. His pre-test median mental age score on the DTLA-1 was 13.6. He was in the public school gifted program. His post-test median mental age was 15.9, and one year posttest was 16.0. At ninth grade graduation, he was recognized as the student having the most A's during junior high school. He is currently a freshman majoring in business at the University of Kansas. He had a 3.4 GPA first semester, while carrying 16 hours, which including statistics and calculus.

C. L. E. took the treatment at age 14.11, with a median mental age of 15.0 on the DTLA-1. Her post-test score three weeks later was 17.8 median mental age. Her one year post-test score was 17.0. Following the treatment, she was classified as gifted in senior high public school, scoring an I.Q. of 151 on the WISC-R (Wechsler, 1949). School officials, being skeptical of this high score, retested her on two other measures, verifying this I.Q. score. This examiner did a three year posttest with the SFTAA (Sullivan, Clark & Tiegs, 1970), in which she scored a 145 I.Q. While in high school she was elected as International Key Club Governor by student Key Club Kiwanians. She graduated from the University of Kansas in 3 1/2 years with a 3.0 GPA, in political science and languages. She is currently employed as an administrative assistant in Presidential Personnel in the White House in Washington D.C.

High Average

C. J. E. was tested for gifted by the public schools at age 12, and did not qualify, with a score of 93% composite on the WISC-R (Wechsler, 1949). The gifted school teacher described her as high average in ability. She had the treatment when she was age 13.3 with a pre-course median mental age of 14.9, and had 17.0 median mental age on the posttest. On the two year posttest, at age 15, her median mental age was 18.0. She is currently 19 years of age, and has finished one year of college at Cal. State Burbank, having been on the Dean's Honor Roll with a 3.9 GPA. She is also actively pursuing an acting career, having received several roles in television and motion pictures.

The Low Average (C to D averages) in high school:

R. L. S. Junior high school counselors told his parents that he did not have the capabilities necessary to attend college. He had difficulties with reading, spelling, and math. He then received this treatment twice, the first time when he was age 15.7, the second time at age 16.7. His first pretest DTLA-1 median mental age was 10.6, his posttest median mental age was 15.0. His second treatment pretest at age 16.7 indicated a median mental age of 15.0, holding the previous gains. His second posttest median mental age was 18.3. He attended the University of Kansas without any tutoring or special assistance, received two scholarships, and managed a local retail store. He graduated from the University of Kansas with a 3.4 GPA in communications, and is working in sales for a pharmaceutical company.

M. E. also was advised by high school counselors that he was not college material, and was receiving C's and D's in high school math. He was tracked college preparatory. He underwent the treatment at age 17.2, with a median mental age of 11.6. Following the treatment, his median mental age was 17.0. Posttest scores three years later indicated his median mental age was 18.0, and by then he had received a B in college calculus. He graduated from the University of Kansas in mechanical engineering with a 3.1 GPA, and is employed as an engineer age 25, at a major aircraft and space manufacturing company.

D. O. took the treatment at age 14.7, and had a median mental

age of 12.3. In the public schools, he was a low achiever. His lowest pretest score of 10.0 was on the DTLA-1 subtest #18, Following Oral Directions sequences. The three week posttest score on #18 was 16.0, and this score held on the one year posttest. His posttest median mental age was 17.0 at age 15.7, and two year posttest was also 17.0 at age 17. He attended technical school, and is employed at 25 as head maintenance supervisor for operative machinery at a plastics manufacturing company. He also serves as a trouble shooter in machine operations.

Learning Disabled - ADHD:

. S. entered the program at age 11.5, with a median mental age of 9.3. He had been a Rh factor infant, and received a total blood transfusion at birth. His pretest auditory processing functioning was at median mental age 5.0 and 6.0. His memory for visual objects was 9.0 median mental age. His median mental age at the end of the first treatment was 11.9. His one year posttest score was 11.3 median mental age. He underwent treatment a second time, and posttested with a median mental age of 16.0, or 6.7 years mental age gain. He is currently a freshman at Oklahoma State University, receiving average grades, without learning disability school assistance.

L. N. entered the treatment twice. The first time at age 13, and again at age 16. Her pretest median mental age score was 10.0, and following the treatment the posttest score was a median mental age of 14.6. Her pre scores ranged from median mental age 9.0 for auditory span for unrelated words, 9.3 for memory for objects, 7.0 for verbal fluency, and 8.0 for spatial designs. Her pretest I.Q. as measured by Slossen was 67. The Short Form Test of Academic Aptitude (SFTAA) Sullivan, E., Clark, W., & Tiegs, E., 1970) pretest indicated an I.Q. of 71. This I.Q. score was confirmed by the public schools. She had qualified as severely learning disabled, within that same I.Q. range. Her mother, an elementary teacher, worked rigorously with the program's manual and tapes system following the treatment. Her one year posttest median mental age was 15.9, up from the posttested median mental age 14.6. Following the second treatment, she had a 17.0 median mental age score. Her posttest

I.Q. measured by the DTLA-2, was 113 (up 46 points from the Slosson Pretest score of 67), posttest on the SFTAA was 95, up 24 points from the pretest score on the SFTAA of 71. After L. N.'s teachers noticed her improvement in school, this researcher was asked to present a teacher's inservice session. This method and materials are currently being field tested in that school district with eight remedial reading students attempted with a regular fifth grade class, when the teacher became seriously ill. She is a sophomore at William Jewell College in Kansas City, with a 2.4 GPA. For her freshman year, she attended Kansas State University, where without any L.D. or outside assistance, she had a 2.2 GPA. For several summers she did clerical work for an accounting firm.

M. N. was learning disabled with severe auditory processing, encoding, and spatial dysfunctions. He received the treatment twice, the first when he was 13.5 years of age, and again at age 15. His first course pre median mental age was 11.6, his posttest median mental age 15.0, and his one year posttest was 16.9. His first course entry auditory processing level was 7.6 median mental age for auditory attention span for sentences, and he posttested at 10.9 median mental age. In a second auditory processing posttest one year later, he tested at 10.3 median mental age. His second course auditory processing posttest was 13.0 median mental age. He attended a private high school, where he graduated with a 3.6 GPA. He also plays tennis, which requires spatial and hand-eye coordination. He now attends a private college, and as a freshman, had a 3.2 GPA.

G. M. had the treatment twice, once at age 12.0, and again at age 15.0. G. M. was attending a school for severely learning disabled in Florida, and came to the Midwest for a month to receive the initial treatment. She was in seventh grade, reading at the fourth grade level. Following the first treatment, she improved from low average, 17% on visual memory and perception, to high average 73% on the Woodcock-Johnson (1977) Psycho-Educational Battery. She returned to the learning disabilities private school in Florida, where the gains were confirmed by the school's routine testing. The school asked this researcher to speak to their teachers regarding this treatment method. After the second treatment, which was in Florida, G. M. left the learning disabilities private school, and was able, with

tutorial help, to maintain a 2.4 GPA at a public high school.

Developmentally Disabled:

C. D. had the treatment three times, at ages 14, 15, and 16. She was placed in special education for mentally handicapped in the public schools. The first pre-test was when she was in eighth grade, and her median mental age scores on the DTLA-1 (Baker & Leland; 1935, 1967) ranged from 7.6 median mental age on spatial designs, to 8.0 median mental age on auditory attention span for unrelated words, and 9.0 median mental age for memory for alphabet letters. Her pre-test score of 10.9 mental age on oral directions was noted as unusually high for one classified as developmentally disabled, even though she was age 14. She scored 0% on both memory and perceptual speed clusters on the Woodcock-Johnson Psycho Educational Battery (1977). Her DTLA pretest I.Q. was 72. Following the third class her I.Q. rose to 107. Her spatial design scores rose from 5% on the second course pretest to 84% on the third posttest on the DTLA-2 (Hammill, 1985). The resource room also post-tested following the third session, and the raw scores matched the 3 year posttests with the treatment. They found her I.Q. to be 97, well within normal ranges, but did not change her developmentally disabled status. C.D. continues to feel most comfortable socially in the disabled class in which she was enrolled. At this writing, her parents have been encouraged to have her re-tested, and possibly reclassified to learning disabled. She will graduate from high school this year. She drives a car, participates in horse shows, which requires following sequences and spatial patterns, and has worked part time as a nurse's aide.

S. K. was classified as developmentally disabled in the special education classes in the public schools. She received this treatment at age 22 while living at home and working as a maid at a motel. On pretest auditory processing, she scored a mental age of 6.6 DTLA-1 (Baker & Leland; 1935, 1967) on memory for unrelated words, 9.0 median mental age on letter sequences, 9.0 on oral directions, and 12.3 on spatial designs. She received the treatment twice, one year following the other. Her second course pretest scores maintained the first posttest scores, following one year interim. Her I.Q. on the first pretest on the SFTAA was 77, her first posttest 87, and her second posttest 99. At this writing

she is attending modeling school, and is employed as an art finisher for an ceramics artist. She lives independently in an apartment, drives her own car, and according to her parents, is nearly self supporting.

Discussion

Learners, either on the job or in school, have inadequate functioning ability levels that can be retrained with systematic instruction. This includes implementing the Sequential-Simultaneous Dichotomy (Kaufman & Kaufman, 1983), within the Guilford (1967) Structure Of Intellect model, with Suggestopedia (Lozanov, 1978), and Cognitive Behavior Modification (CBM) (Meichenbaum, D, 1977) learning techniques.

Specific cognitive deficiencies can be isolated through testing with the individual (Meeker, 1969). Detroit Tests of Learning Aptitude (DTLA-1; Baker H., & Leland, B; 1935, 1967) can measure specific areas of cognitive functioning in the individual in a progressive fashion. Information processing deficiencies and weaknesses can be identified and pinpointed for corrective purposes along the entire processing hierarchy line (see Figure 1).

Auditory and visual incoming stimuli enter the perceptual level and proceed up the level of processing model through memory and symbolic levels to the conceptual level (see Figure 1). According to Meeker (1969), and Kirby and Das (1977), a combination of both successive and simultaneous processing is related to conceptualization that leads to academic achievement.

An information processing ability deficiency can be described as a weakness along the level of a processing hierarchy framework line. Deficits along the lower part of the processing line, including inadequate short-term memory encoding capabilities, interfere with conceptualization at a higher level (Johnson &

Myklebust, l967). Information is first perceived, then passes through imagery, symbolization, and finally enters conceptualization. Therefore, exercises in imagery, along with encoding control strategy training, become an underlying foundation component in the development of comprehension. If a processing deficiency occurs within either the simultaneous or successive system, the individual will compensate for the deficient system (Kirby & Das, 1977). As a result, a rigidity of thought patterns which can indicate a difficulty with cognitive flexibility (Meeker, 1969; Cordoni, 1980) will occur.

An important part of the CBM procedure used in this study included the concept of modeling, using both peers and puppets (Erland, 1980). Bandura's (1971) four components of the modeling paradigm which govern modeling phenomena are: 1) attentional processes are channeled by influential characteristics of the model; 2), information relayed is more likely to be retained into memory representations; 3) information will be remembered if it is integrated into actual performance; and 4) it will be remembered and acted upon if the factors involved are motivational in nature.

The overt and covert CBM verbalization strategies outlined by Meichenbaum (l977) are an important component. The gradual removal of cues and prompts, so that the learner becomes self monitoring, is part of facilitating the generalization to academics (Sloan, C., 1980; Harris, K., l982).

One of the basic underlying principles of CBM is overt and covert rehearsal which forms the framework of meta-cognition. Spear (l978) affirms that continuous repetition, until the retention test, is helpful for short-term memory recall. A way to insure a depth of information processing is to increase the number of repetitions. As the degree of learning verbalized materials increases, the chances of forgetting the materials decreases.

Frequent repetition also facilitates a rapid change of psychological and physiological structure (Luria, l966; Lynch, 1984). The solid framework of overlearning information implies firmer generalization effects (Spear, 1978).

Working memory functions as the work space for reasoning and language comprehension (Howard, 1983). Elaborative rehearsal and encoding are closely related. The stimulus itself is not stored, but only some encoding or representation of it (Bower, 1972).

Elaborative rehearsal can strengthen working memory, and decay can be eliminated in spite of the addition of interference (Howard, 1983). If the stimulus is masked by other events, the initial stimulus can be recalled by the strengthened working memory. This strengthened memory storage can range from controlled to automatic thinking ability (Howard, 1983). Controlled processing uses a limited capacity system. Automatic processing can hold a larger array of information.

Memory span capacity and length can be increased through elaborative rehearsal (Craik & Lockhart, 1972). Although Miller (1956) proposes that the working memory is limited in capacity size. The capacity size varies from individual to individual, and the working memory holds chunks or units of seven plus or minus two; rehearsal can increase the memory span and length beyond these limitations. Allport (1980) suggests that there are no limitations to sensory input, or the ability to filter information. This led some researchers to rely on top-down, or contextual approaches, in the processing of information (Gardner, 1985), rather than the bottom-up design of Woodcock (1978).

Kahneman and Henik (l978), discussing a group processing model for tachistoscopically exposed visual letters and digits, state that memory storage capacity for grouped items such as visual letter and digit spans vary according to group size, length, and exposure conditions, along with homogeneous and cueing

factors, and that the average visual memory span length is four items. Auditory short-term memory also has capacity limitations, which vary from individual to individual. The average auditory short-term memory span length is somewhere between four and five items, depending upon spatial orientation, sound quality, and loudness of the stimuli (Massaro, l978).

The depth of processing is a crucial component of information processing. According to Rumelhart (l978), there are six interactive parallel levels of visual memory processing, beginning with a feature level and going up to the syntactic and semantic level. The perceptual levels interrelate, and each level depends on the underlying foundation level. Reading comprehension begins at the feature level of words, progresses through the letter level, the letter cluster level, the lexical level, and the syntactic level, up to the highest semantic level (Rumelhart, 1978). Memory processing interference at any of the levels will necessarily inhibit conceptualization at the semantic level. Therefore, if the underlying levels are correctly perceived and processed, then understanding or conceptualization results (Johnson & Myklebust, 1967; Craik & Lockhart, 1972). Auditory events also must be processed sequentially, and the significance of a particular word or event is established in relation to the preceding one (Spear, l978).

The ultimate goal is for an individual to be able to process large amounts of information, and to mentally organize many systems and relationships into a conceptual framework of integration. According to Jackson & McClelland (l975) and Rumelhart (1978), good readers are capable of integrating more perceived elements into an organized conceptual representation. Sternberg (1966) states that individuals must search through their working memory using either high speed serial or parallel scanning methods.

It is important that successful training procedures generalize outside the training sessions. Harris (I982) listed fifteen suggestions, compiled from several authorities, that affect durability and generalization of CBM training. One suggestion was that generalization is more likely to occur if the learner gains increased self-esteem and confidence as a result of the training, and attributes the observed changes to the degree of their own efforts.

Follow-up studies showed that these abilities were maintained. Most subjects continued to practice on their own the techniques learned in the treatment program. Substantial gains were evident in the subtests Memory for Unrelated Words (# 06), and Following Oral Directions (# 18), indicating an increased memory span capacity and strength. Subtest # 18 measured the ability to follow a progressively complicated series of oral directions on paper using both auditory and visual integration. The significant improvement on these subtests indicated that the learners were covertly using the memory and thinking encoding strategies learned in the training procedures.

Other standardized tests were used to cross correlate and validate the one to three year posttest scores, confirming the gains made. These other tests were administered not only by this examiner, but by other specialists in both private and public schools.

Although many motivational teaching systems exist, it is believed that the substantial gains and improvement evidenced in this study were not significantly attributable to motivational improvement. It may have been a contributing factor, in accordance with Bandura's Social Learning Theory (1971).

In this study, both students and their parents reported that the overlearning elaborative rehearsal system contributed to a generalized use of the metacognitive, self-regulatory trained skills. Of the fifteen learning disabled subjects retested

longitudinally in Experiment II, eleven went on to college, with the remaining four still attending high school. Now the learning disabled subjects are maintaining average to above average grades, and of the eleven, three have graduated from a University, two with honors, and all without special learning disability class assistance.

Caveats:

Creative applications of CBM are not a panacea in all classroom or on the job learning situations. There are several pragmatic drawbacks in using drilling methods in a classroom or work environment. These are some of the problems that were observed and adapted to in the development of this program:

I. Overworked and heavily scheduled classroom teachers lack the time, energy, and commitment to implement individualized, intensive drilling, and instruction of thinking skills. Classroom repetitive drilling could possibly be implemented by using supplemental media materials, such as computer programs, and audio and visual programs. Classroom teachers would need In-Service training, to show the benefits and validity of allocating valuable class time in teaching a new method that they are not familiar with.

2. Daily classroom schedules or on-the-job work schedules lack both time allotment and flexibility to include daily drilling procedures that would improve thinking capabilities. It is difficult to convince administrators and managers that the increased benefits are worth the time allocation and monetary investment.

3. Most classroom or work environments would not be conducive to novel or creative applications, unless the applications were a part of carefully prescribed video and audio materials. To implement these applications, facilitator training sessions would be required.

4. Drilling procedures would need to be highly structured and administered along careful guidelines. Haphazard implementation would negate desired effects.

5. Many individuals are comfortable at their present performance level and cannot, or do not, perceive the need for self-improvement. The decision to receive the training may best be made by the administrator as well as the individual.

6. The training requires follow-through and self discipline. Since many individuals lack these traits, administrators and managers would need to implement a reward and goal achievement plan.

7. Since almost everyone would benefit from memory and thinking improvement, it would be difficult in either schools or businesses to determine who would receive the training first.

8. Carefully administered and interpreted individualized evaluative testing would be necessary to monitor and measure gains made by the learner. Trained practitioners and specialists would be required.

Conclusion

Additional study is needed to determine if the positive results obtained in a small, carefully controlled environment can be successfully reproduced in conventional classroom settings, in business environments, and across a range of populations. It should be emphasized that the treatment should be matched to the needs of the learner. Individualized testing would be necessary to determine and monitor these needs, in order for a particular system to be widely implemented.

New teaching concepts and methods incorporating Cognitive Behavior Modification and Suggestopedia techniques, retraining cognitive abilities, need to be examined for possible implementation in schools and in the work place. Many individuals are seeking new ways for self-improvement. Parents, school and business administrators, and executive management, in order to counterbalance increasing pressures for higher achievement and productivity, need to be open to new and effective programs that achieve and maintain results.

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