Recent Advances in Mnemonic Strategy Training with Mentally Retarded Persons: Implications for Educational Practice

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A portion of the empirical literature on training mentally retarded people to use mnemonic strategies was reviewed. Specific topics examined included strategy maintenance, strategy generalization, and metamemory, with emphasis on the implications of this research for the education of retarded students. We concluded that although significant gains have resulted from the past two decades of research, many questions of educational significance remain unanswered. With the restrictions placed by recent research in mind, we suggested that this area can be of immediate benefit to special educators.

During the past 15 years, researchers working in the field of mental retardation have witnessed the accumulation of a sizeable literature concerned with improving the memory skills of retarded individuals. Investigators who have adopted the "instructional approach" (Belmont & Butterfield, 1977) have repeatedly demonstrated that retarded persons can learn to use mnemonic strategies effectively. Instruction in the use of language mediators (Turnure & Thurlow, 1975; Wanschura & Borkowski, 1974), repetitive rehearsal (Kellas, Ashcraft, & Johnson, 1973; Turnbull, 1974), grouping/organizational strategies (Ashcraft & Kellas, 1974; Luszcz & Bacharach, 1975), and, more recently, complex semantic/self-interrogative processing techniques (Engle & Nagle, 1979; Kendall, Borkowski, & Cavanaugh, in press; Turnure, Buium, & Thurlow, 1976) have all been shown to improve the learning and memory skills of retarded individuals.

The success of these studies have caused many individuals to look upon this area as harboring great hope for the eventual development of programs designed to improve the educational skills of retarded children. In an article that is representative of that mode of thought, Winschel and Lawrence (1975) concluded: "The body of knowledge and derived strategies which have been amassed in this area in more than a decade now warrant extensive implementation in classroom settings, from which we may expect to garner new insights into the education of retarded children as well as new directions for laboratory research" (p. 406).

The many training studies that were undertaken in the period prior to the completion of the Winschel and Lawrence (1975) paper suggested that retarded individuals could be trained to use mnemonic strategies effectively. The research completed since that time has been focused on issues beyond simple instructional effects, and the ability of retarded persons to maintain, generalize, and monitor the use of trained mnemonic strategies has been examined. Other researchers have begun to evaluate memory programs designed for classroom implementation. Unfortunately,

inspection of this research does not support unequivocally many of the optimistic conclusions concerning the desirability of immediate and widespread implementation of these types of training programs within special education settings. In this paper we provide a look at some of the most recent additions to this literature and examine the implications of these investigations for the education of retarded individuals.

As previously indicated, the number of experimental inquiries in this area has rapidly increased. Numerous authors have reviewed portions of the literature (Belmont & Butterfield, 1977; Borkowski & Cavanaugh, 1979; Borkowski & Wanschura, 1974; Brown, 1974, 1975, 1978; Butterfield & Belmont, 1976; Campione & Brown, 1977; Winschel & Lawrence, 1975), and we make no attempt to duplicate these efforts; however, only Winschel and Lawrence (1975) have directly addressed the question of educational implications of mnemonic strategy training research. The potential impact of this area coupled with the significance of recent research make further discussion of these issues imperative.

Before beginning, we also note that this paper was focused on studies that were designed to alter the information processing of mildly retarded individuals through instruction in the use of mnemonic strategies. The research examined was generally restricted to studies in which mildly retarded individuals (IQ 50 to 75, educationally mentally handicapped, educable mentally retarded, familially retarded) were employed as subjects. This constraint was necessary because the overwhelming majority of training studies have utilized this population. Furthermore, it is important to understand the implications of this line of research for mildly retarded persons before attempting to apply the findings to more severely retarded individuals.

The Search for Relevance

Strategy maintenance and generalization both refer to use of a trained strategy following completion of the training experience. Campione and Brown (1977) proposed use of these terms in place of retention and transfer because the latter have often been used interchangeably even though they describe very different circumstances. Following their suggestion, we use strategy maintenance (or retention) to refer only to situations where there is no change in the experimental task used during training and testing and strategy generalization (or transfer) to describe instances that are designed to evaluate the use of a strategy on a task that is clearly different from the one used during training.

Most recently, investigators have begun to examine the ability of retarded subjects to monitor their own cognitive processes as well as the relationship between this set of skills and memorial ability. Brown (1975) has referred to this cognitive domain as "knowing about knowing," and, in general, these skills have been subsumed under the headings of metamemory (Brown, 1975; Flavell & Wellman, 1977) and executive control (Butterfield & Belmont, 1976; Butterfield, Wambold, & Belmont, 1973). For our purposes these skills include, but are not limited to, the ability to organize and evaluate the use of mnemonic control strategies (Butterfield & Belmont, 1976). These investigations have already had a significant impact on all attempts to design and implement cognitive instructional programs for developmentally young or disabled people.

Strategy Maintenance

Perhaps more than any other single type of investigation, studies of strategy maintenance appear to be responsible for the optimism generated in this field. Not only can retarded individuals learn to use mnemonic strategies effectively, but they also have demonstrated retention of the strategy for periods of 2 weeks (Kellas et al., 1973; Reichhart, Cody, & Borkowski, 1975) to 6 months (Brown, Campione, & Murphy, 1974; Engle & Nagle, 1979) to 1 year (Brown, Campione, & Barclay, 1979). This level of performance often results from no more than two or three training sessions, each of approximately 1 hour in duration, that are spread out over at least a 2-day period (Borkowski & Cavanaugh, 1979).

This finding indicates that students are able to keep trained strategies available for future use if, of course, the subsequent task is the same as the original training task. More significantly, the strategy training and maintenance literature reveals that developmentally young people can use mnemonic strategies such as chunking, elaboration, and repetitive rehearsal to learn and retain information. This knowledge is likely to have its most immediate impact on programs directed at teaching adaptive information (addresses, street and telephone numbers) and skills (money management, time concepts). Clearly, there should be no delay in the development and evaluation of training programs designed to accomplish these goals.

Strategy Generalization

If one strictly adheres to the notion that strategy generalization is demonstrated only when individuals use a trained strategy on a task that is clearly different from the training task, the evidence for generalization among mentally retarded people is scarce. At this time, Brown et al. (1979) have completed the most impressive study demonstrating mnemonic strategy generalization. Brown and her colleagues trained mildly retarded children to use a recall readiness strategy to check and monitor their memory. The children were taught to study a supra-span list of pictures until they felt ready to recall them. On a posttest that followed training by 1 year, older children (mental age [MA] 8 years) not only demonstrated maintenance of the recall readiness strategy on the original training task, but also showed evidence that they could use the strategy to facilitate the gist recall of prose passages. Not only did the trained group recall more thematic-idea units from the passages, but they also studied longer, which provided convergent validation for the belief that use of the strategy was responsible for improved performance.

In a similar fashion, Belmont, Butterfield, and Borkowski (1978) have demonstrated that generalization of a cumulative rehearsal strategy may be enhanced by training individuals to use two slightly different variants of a strategy (as opposed to one) and by providing them with feedback concerning the relationship between input (rehearsal) and output (recall) requirements. In this study retarded adolescents were trained to use a cumulative rehearsal–fast-finish strategy (Pinkus & Laughery, 1970) to recall a series of seven letters in circular fashion (the last four letters followed by the first three). When the circular-recall requirement changed (the last four letters followed by the first three), only half the children received additional training and feedback concerning the necessary modification in the rehearsal strategy. Results 2 weeks after training revealed that only the twice-trained group was able to transfer use of the rehearsal strategy to facilitate performance on a novel memory task (serial-position probe).

The type of generalization demonstrated in the Belmont et al. (1978) and Brown et al. (1979) studies has been referred to as "far generalization" because of the distinct changes in task requirements during training and transfer. Other researchers have demonstrated what has been referred to as "near generalization" (Kendall et al., in press; Ross & Ross, 1978; Ross, Ross, & Downing, 1973). These near-generalization studies are not pure tests of generalization as we have defined it because the difference between the training and transfer tasks are minimal. For example, in the studies cited as representative of near generalization, researchers have shown that with extensive instruction, retarded youngsters trained to use an elaboration strategy to associate word pairs (or triads) in classroom games (Ross & Ross, 1978; Ross et al., 1973) and on a paired-associate learning task (Kendall et al., in press) later performed better than did untrained individuals on multiple-associate learning tasks.

These results are encouraging; however, the paucity of data makes it impossible to make conclusions with any degree of certainty about the conditions that facilitate strategy generalization. The available evidence does indicate, however, that those procedures that we discussed earlier as being related to the development and maintenance of strategic behavior (multiple

training trials and training on more than one day) are not sufficient for promoting generalization (Brown, Campione, & Murphy, 1977; Burger, Blackman, & Tan, 1980; Campione & Brown, 1977; Kramer & Engle, Note 1). This has led most researchers in the area to abandon attempts to train only specific strategies or control processes and instead to study the effect of more general factors such as people's knowledge of their own memory processes (Campione & Brown, 1977).

Thus, it appears that educators should not routinely expect students to generalize classroom-trained strategies to novel tasks; however, future research conducted in classroom settings where individuals can receive intensive and long-term training may prove more fruitful. Regardless, strategy generalization must remain as the ultimate goal of this field. The prospect of having to train a strategy every time a task changes is not nearly as encouraging (or productive) as training a mnemonic and then having an individual spontaneously employ it whenever appropriate. Only continued investigation can provide answers about whether generalization of trained mnemonic strategies by the retarded individual is an unrealistic goal or simply waits for the application of appropriate instructional routines.

Metamemory

Disillusionment with training retarded persons to use mnemonic strategies and the search for more general factors underlying memory performance can be traced to an early study by Butterfield et al. (1973). Butterfield and his associates led retarded individuals through a complex series of training steps and ultimately succeeded in raising performance levels to those of untrained college students. The problem with this training approach was that it required extensive task analysis and detailed strategy training for each investigative area. The solution Butterfield et al. envisioned was not to focus on individual tasks, but to concentrate on training the "selecting, sequencing and coordinating processes" (p. 668) common to most memory tasks.

To date, the most extensive research on retarded persons' use of these metamemorial skills has been conducted by Brown and her associates at the University of Illinois. Their research has revealed that the memory difficulties encountered by retarded individuals may result from more basic deficiencies than just the absence of mnemonic control strategies. Retarded people experience problems with a number of metamemorial skills, including evaluating their recall readiness (Brown & Barclay, 1976), estimating their memory span (Brown et al., 1977), appropriately apportioning study time (Brown & Campione, 1977), and judging their feeling of knowing experience (Brown & Lawton, 1977).

The ability of most children to perform those memory-monitoring skills improves markedly with age (Cavanaugh & Borkowski, 1979; Kruetzer, Leonard, & Flavell, 1975); however, the research by Brown and her colleagues indicates that this improvement is not nearly as dramatic with retarded individuals. Further analysis of the importance of metamemorial factors is clouded by the fact that there is an apparent absence of data that would suggest a firm connection between memory awareness and cognitive behavior of developmentally young individuals (Cavanaugh & Borkowski, 1979; Kelly, Scholnick, Travers, & Johnson, 1976; Kreutzer, Leonard, & Flavell, 1975; Moynahan, 1976; Salatas & Flavell, 1976; Kramer & Engle, Note 1). This is reflected by the fact that when presented with a memory task, developmentally young subjects do not always act as they say they would, leading to the suggestion that no obvious connection exists between verbalized knowledge of the memory system and mnemonic behavior (Flavell, Note 2).

Thus, there is currently little evidence indicating that teachers should concentrate on attempting to increase retarded children's knowledge of their memory system. This knowledge, by itself, appears to have little effect on memory performance (at least with developmentally young people). In contrast, the most productive instructional approach for individuals concerned with strategy generalization is to

concentrate on improving metamemorial skills such as estimation, comparison, and decision making (Brown et al., 1979; Butterfield & Belmont, Note 3). While it may be true that improved knowledge of the memory system will result from this type of training and that this knowledge will be an important component of generalization, the available evidence indicates that awareness alone is not sufficient for eliciting generalized use of problem-solving skills.

Mnemonic Strategy Training: Implications for Education

Classroom Studies

If the work discussed in this paper has an underlying, although often unstated goal, it is that the results will someday lead to improvements in the educational curriculum and subsequently the educational skills of retarded individuals. Although an admirable goal, the transition from basic research to applied utilization is not often easily accomplished (Guskin & Spiker, 1968). This transition has not been facilitated by the fact that the overwhelming majority of these studies have taken place out of the regular classroom in laboratory settings. Recent programs developed at the University of Minnesota are an exception and illustrate just how the instructional procedures developed from the mnemonic training research can be implemented in the classroom (Taylor, Thurlow, & Turnure, 1977; Thurlow, Turnure, Taylor, Krus, & Howe, Note 4). These programs all used elaboration-based vocabulary instruction to teach children important language concepts. The elaboration process involves bringing two (or more) objects together (through language, pictures, or visual imagery) in a manner that establishes a relationship between those objects (Rohwer, 1973). The earliest attempts to improve the memory skills of retarded persons involved elaboration training (Jensen & Rohwer, 1963; Milgram, 1967, 1968), and these procedures have repeatedly been found to facilitate retention (Borkowski & Wanschura, 1974).

The format of these instructional programs involves specifying certain content areas to be mastered (measurement, time, money, weight, and length), dividing each area into units consisting of related vocabulary words, and instruction emphasizing definitions, elaborations, and relationships. Each unit begins with the presentation and definition of the vocabulary words, followed by the introduction of verbal and visual materials that elaborate on the meaning of those words. The relationship of a vocabulary word to other vocabulary words, to previous instruction, and to personal experience is continually emphasized. Units conclude with a thematic summary stressing the interrelationship of the material in the unit. Subsequent work by both Taylor et al. (1977) and Engle and Nagle (1979) revealed that the emphasis on relationships is a critical component of the instructional package.

Evaluation of the measurement, money, and time program (Thurlow et al., Note 4) indicated that elaboration-based instruction was more effective than were the techniques traditionally used in these classrooms. Data from the latter two programs revealed that retarded children who had originally scored far below nonretarded students (MA-matched) on pretests were able to raise their performance to the level of the nonretarded subjects as a result of training. In some cases, these gains brought the performance of the retarded group to that of untrained (CA-matched) nonretarded children. In a similar fashion, results from the Taylor et al. (1977) study demonstrated that vocabulary instruction emphasizing elaborations and semantic relationships improved performance not only on the specific vocabulary used during training, but also on tests of general vocabulary skill.

This work indicates that mnemonic instruction can be utilized in applied settings, and it does not stand alone as an example of classroom intervention. Ross et al. (1973) and Ross and Ross (1978) trained mildly retarded (EMR) children in self-contained classes to use visual imagery to remember information from stories and games presented in the classroom. Not only were the imagery-trained children able to use the strategy to improve performance in the

classroom, but results 5 months after training (Ross & Ross, 1978) indicated that these children reported using imagery on multiple-associate learning tasks. Most importantly, results from this delayed posttest indicated that the imagery-trained children outperformed individuals who had originally received either cumulative rehearsal or no training.

In another important example of classroom research, Bornstein and Quevillon (1976) taught three 4-year-old children covert self-instruction in an attempt to reduce inappropriate classroom behavior. Self-instruction has gained increased attention from both behavioral and cognitive researchers and has been demonstrated to alter effectively the behavior of both nonretarded (Hartig & Kanfer, 1973; Meichanbaum & Goodman, 1971) and retarded (Engle & Nagle, 1979; Kendall, Borkowski, & Cavanaugh, in press) individuals. Children in the Bornstein and Quevillon study were taught to initiate a set of instructions covertly ("What does the teacher want me to do?" "I'm supposed to copy that picture," "OK, first I draw a line here," "I really did that one well") when presented with tasks taken from a number of different intelligence tests. Subsequent to training, these children dramatically improved their rate of on-task behavior in the classroom and maintained these gains 3 months after training.

It is important to note that in a recent study with 7- and 8-year-olds, Friedling and O'Leary (1979) failed to produce an increase in the on-task classroom behavior of children who had received self-instruction training similar to that employed by Bornstein and Quevillon (1976). This finding illustrates that, as in other areas of cognitive instructional research, questions regarding the ability of developmentally young children to generalize consistently the use of self-instructional procedures remain unanswered (Rosenbaum & Drabman, 1979). The evidence presented, however, does make it very clear that individuals can be trained to use strategies such as verbal elaboration, repetitive rehearsal, visual imagery, and self-instruction to improve performance on specific tasks.

Implications and Future Directions

The results of research on strategy maintenance, strategy generalization, and metamemory are encouraging and may lead to more attempts to design instructional programs utilizing the techniques developed in mnemonic training research. These findings have led Brown and Campione (1977) to suggest that there are currently two specific types of situations where education in general, and retarded children specifically, might benefit from the detailed analysis and training inherent in these programs. They recommended training developmentally young children to use specific task/strategy relationships when either (a) mastery of the experimental task/materials is itself of great value or (b) when the trained skill is applicable in a wide range of settings.

As we have already seen, programs that fit the criteria of Brown and Campione can be successfully used in the classroom. As a result of cognitive instructional research, developmentally young children have learned general vocabulary (Taylor et al., 1977), vocabulary important in a variety of adaptive skills (Thurlow et al., Note 4), and skills such as self-instruction or self-interrogation (Bornstein & Quevillon, 1976; Engle & Nagle, 1979; Kendall et al., in press) that appear to be important in solving a variety of tasks. This does not obscure the fact that there are limitations in the extent of our knowledge. It is important that we remain aware of these gaps and realize that although specific task-strategy relationships can be trained, current research does not provide us with the capacity to train retarded children to behave more intelligently (Campione & Brown, 1977). That is, we have been able to remediate specific deficits in cognitive processes, but we have not been very successful in teaching the more general metacognitive skill of spontaneously employing relevant strategies in the presence of new tasks.

As suggested earlier, these limitations indicate that basic research examining the memory skills of retarded persons must continue. In addition, advancements in this area will come more rapidly if educational

researchers begin to investigate the conditions that lead to sophisticated strategy utilization in the classroom. For example, under what conditions does strategy generalization occur in the classroom? What are the characteristics of mature strategy users? How prevalent are the use of self-checking and self-interrogative strategies, and are these strategies related to superior performance? Can we develop direct measures of strategy use for strategies such as self-instruction? Can we train teachers to recognize and reinforce their occurrence? What effect does reinforcement have on the use of mnemonic strategies? What is the relationship of memory awareness to memory performance in classroom activities? Can group instructional procedures be devised that make cognitive training programs more cost efficient? These and a host of similar questions make it apparent that although the mnemonic training field has taken great strides, there is still a long way to go. Until these types of answers are provided, this area cannot hope to maximize its contribution to the education of mentally retarded students.

General Summary

The research examined in this paper reveals that although investigators understand the conditions leading to strategy maintenance, they have had very little success in obtaining strategy generalization and are only beginning to understand and investigate the influence of metamemorial factors on strategic behavior. It appears that if the goals of these training programs remain within the boundaries suggested by Brown and Campione (1977), they can be of some immediate benefit to special educators. Instructional programs such as those developed by researchers at the University of Minnesota (Taylor et al., 1977; Thurlow et al., Note 4) can be successfully integrated into the classroom environment. These programs can be successfully implemented when the goal of training is to teach skills or information contained within specific task-strategy relationships.

More often the aim of researchers has been to teach a level of understanding that will lead to generalized use of trained strategies. Unfortunately, very few training programs have met this criterion (Butterfield & Belmont, Note 3). Future researchers must utilize both the experimental laboratory and the classroom in order to provide a more complete understanding of the factors leading to sophisticated utilization of cognitive strategies. It is only at this point that researchers can begin to train developmentally young children to use these skills. Then if these programs are successful, attempts can be made to integrate those findings into the curriculum of retarded persons.

It is appropriate to conclude with the comments of Winschel, Ensher, and Blatt (1979) who, in discussing the need for programs designed to teach retarded persons how to think, aptly summarized the direction and goals of the mnemonic training field:

. . . teachers, knowledgeable in science and humanities—spend endless hours training children to button coats, shake hands, and read preprimers. While this type of education may lead to children who are more "acceptable" and more "manageable," the retarded are defeated inevitably by the multitude of specific skills necessary for minimal functioning in society. The efforts are laudable but the central objective, increased problem-solving behavior, is largely ignored. Clearly, we need to develop educational approaches which, in addition to teaching children to know more, help them to think better. (p. 26)

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Reference Notes

1. Kramer, J., & Engle, R. *The effects of rehearsal training and metamemorial feedback on children's mnemonic performance.* Unpublished manuscript, University of South Carolina, 1979.
2. Flavell, J. H. *Cognitive monitoring.* Paper presented at the Conference on Children's Oral Communication Skills, University of Wisconsin, Madison, October 1978.
3. Butterfield, E. C., & Belmont, J. M. *Instructional techniques that produce generalized improvements in cognition.* Paper presented at the annual Gatlinburg Conference on Research in Mental Retardation, March 1979.
4. Thurlow, M., Turnure, J., Taylor, A., Krus, P., Howe, R., & Troup, J. *An assessment of the effec-*

tiveness of the money, measurement and time pro-gram for EMR children (Research rep. 87). Min-neapolis: University of Minnesota, Research, De-velopment and Demonstration Center in Education of Handicapped Children, March 1975.

References

Ashcraft, M. H., & Kellas, G. Organization in normal and retarded children: Temporal aspects of storage and retrieval. *Journal of Experimental Psychology*, 1974, 103, 502–508.

Belmont, J. M., & Butterfield, E. C. The instructional approach to developmental cognitive research. In R. Kail & J. Hagan (Eds.), *Perspectives on the devel-opment of memory and cognition.* Hillsdale, NJ: Lawrence Erlbaum Assoc., 1977.

Belmont, J. M., Butterfield, E. C., & Borkowski, J. G. Training retarded people to generalize memorization methods across memory tasks. In M. M. Grunebery, P. E. Morris, & R. N. Sykes (Eds.), *Practical as-pects of memory.* London: Academic Press, 1978.

Borkowski, J. G., & Cavanaugh, J. C. Maintenance and generalization of skills and strategies by the retarded. In N. R. Ellis (Ed.), *Handbook of mental deficiency: Psychological theory and research* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Assoc., 1979.

Borkowski, J. G., & Wanschura, P. B. Mediational processes in the retarded. In N. R. Ellis (Ed.), *In-ternational review of research in mental retardation* (Vol. 7). New York: Academic Press, 1974.

Bornstein, P. H., & Quevillon, R. P. The effects of a self-instructional package on overactive preschool boys. *Journal of Applied Behavior Analysis*, 1976, 9, 179–188.

Brown, A. L. The role of strategic behavior in retar-date memory. In N. R. Ellis (Ed.), *International review of research in mental retardation* (Vol. 7). New York: Academic Press, 1974.

Brown, A. L. The development of memory: Knowing, knowing about knowing, and knowing how to know. In H. W. Reese (Ed.), *Advances in child develop-ment and behavior* (Vol. 10). New York: Academic Press, 1975.

Brown, A. L. Knowing when, where, and how to remember: A problem of metacognition. In R. Glaser (Ed.), *Advances in instructional psychology.* Hillsdale, NJ: Lawrence Erlbaum Assoc., 1978.

Brown, A. L., & Barclay, C. R. The effects of training specific mnemonics on the metamnemonic effi-ciency of retarded children. *Child Development*, 1976, 47, 71–80.

Brown, A. L., & Campione, J. C. Training strategic study time apportionment in educable retarded chil-dren. *Intelligence*, 1977, 1, 94–107.

Brown, A. L., Campione, J. C., & Barclay, C. R. Training self-checking routines for estimating test readiness: Generalization from list learning to prose recall. *Child Development*, 1979, 50, 501–512.

Brown, A. L., Campione, J. C., & Murphy, M. D. Keeping track of changing variables: Long-term re-tention of a trained rehearsal strategy by retarded adolescents. *American Journal of Mental Defi-ciency*, 1974, 78, 446–453.

Brown, A. L., Campione, J. C., & Murphy, M. D Maintenance and generalization of trained meta mnemonic awareness by educable retarded children *Journal of Experimental Child Psychology*, 1977, 24, 191–211.

Brown, A. L., & Lawton, S. C. The feeling of knowing experience in educable retarded children. *Devel-opmental Psychology*, 1977, 13, 364–370.

Burger, A. L., Blackman, L. S., & Tan, N. Mainte-nance and generalization of a sorting and retrieval strategy by EMR and nonretarded individuals. *American Journal of Mental Deficiency*, 1980, 84, 373–380.

Butterfield, E. C., & Belmont, J. M. Assessing and improving the executive cognitive functions of mentally retarded people. In I. Bialer & M. Sternlicht (Eds.), *Psychological issues in mental retardation.* Chicago: Aldine, 1976.

Butterfield, E. C., Wambold, C., & Belmont, J. M. On the theory and practice of improving short-term memory. *American Journal of Mental Deficiency*, 1973, 77, 654–669.

Campione, J. C., & Brown, A. L. Memory and metamemory development in educable retarded children. In R. Kail & J. Hagan (Eds.), *Perspectives on the development of memory and cognition.* Hills-dale, NJ: Lawrence Erlbaum Assoc., 1977.

Cavanaugh, J. C., & Borkowski, J. C. The metamemory-memory "connection": Effects of strategy training and maintenance. *Journal of Gen-eral Psychology*, 1979, 101, 161–174.

Engle, R. W., & Nagle, R. J. Strategy training and semantic encoding in mildly retarded children. *In-telligence*, 1979, 3, 17–30.

Flavell, J. H., & Wellman, H. M. Metamemory. In R. Kail & J. Hagan (Eds.), *Perspectives on the devel-opment of memory and cognition.* Hillsdale, NJ: Lawrence Erlbaum Assoc., 1977.

Friedling, C., & O'Leary, S. G. Effects of self-instructional training on second- and third-grade hyperactive children: A failure to replicate. *Journal of Applied Behavior Analysis*, 1979, 12, 211–219.

Guskin, S. L., & Spiker, H. H. Educational research in mental retardation. In N. R. Ellis (Ed.), *Interna-tional review of research in mental retardation* (Vol. 3). New York: Academic Press, 1968.

Hartig, M., & Kanfer, F. H. The role of verbal self-instruction in children's resistance to temptation. *Journal of Personality and Social Psychology*, 1973, 25, 259–267.

Jensen, A. R., & Rohwer, W. D., Jr. The effect of verbal mediation on the learning and retention of paired-associates by retarded adults. *American Journal of Mental Deficiency*, 1963, 68, 80–84.

Kellas, G., Ashcraft, M. H., & Johnson, N. S. Re-hearsal processes in short-term memory perform-ance in mildly retarded adolescents. *American Journal of Mental Deficiency*, 1973, 77, 670–679.

Kelly, M., Scholnick, E. F., Travers, S. H., & Johnson, J. W. Relations among memory, memory appraisal, and memory strategies. *Child Develop-ment*, 1976, 47, 648–659.

Kendall, C., Borkowski, J. G., & Cavanaugh, J. C. Maintenance and generalization of an interrogative strategy by EMR children. *Intelligence*, in press.

Kreutzer, M. A., Leonard, C., & Flavell, J. H. An interview study of children's knowledge about memory. *Monographs of the Society for Research in Child Development*, 1975, 40 (1, Serial No. 159).

Luszcz, M. A., & Bacharach, V. R. List organization and rehearsal instructions in recognition memory of retarded adults. *American Journal of Mental Deficiency*, 1975, 80, 57–62.

Meichanbaum, D., & Goodman, J. Training impulsive children to talk to themselves: A means of developing self-control. *Journal of Abnormal Psychology*, 1971, 77, 115–126.

Milgram, N. A. Retention of mediation set in paired-associate learning of normal and retarded children. *Journal of Experimental Child Psychology*, 1967, 5, 341–349.

Milgram, N. A. The effects of MA and IQ on verbal mediation in paired-associate learning. *Journal of Genetic Psychology*, 1968, 113, 129–143.

Moynahan, E. D. The development of the ability to assess recall performance. *Journal of Experimental Child Psychology*, 1976, 21, 94–97.

Pinkus, A. L., & Laughery, K. R. Recoding and grouping processes in short-term memory: Effects of subject paced presentation. *Journal of Experimental Psychology*, 1970, 85, 335–341.

Reichhart, G. J., Cody, W. J., & Borkowski, J. G. Training and transfer of clustering and cumulative rehearsal strategies in retarded individuals. *American Journal of Mental Deficiency*, 1975, 79, 648–658.

Rohwer, W. D., Jr. Elaboration and learning in childhood and adolescence. In H. W. Reese (Ed.), *Advances in child development and behavior* (Vol. 8). New York: Academic Press, 1973.

Rosenbaum, M. S., & Drabman, R. S. Self-control training in the classroom: A review and critique. *Journal of Applied Behavior Analysis*, 1979, 12, 467–485.

Ross, D. M., & Ross, S. A. Facilitative effect of mnemonic strategies on multiple-associative learning in EMR children. *American Journal of Mental Deficiency*, 1978, 82, 460–466.

Ross, D. M., Ross, S. A., & Downing, M. L. Intentional training vs. observational learning of mediational strategies in EMR children. *American Journal of Mental Deficiency*, 1973, 78, 292–299.

Salatas, H., & Flavell, J. H. Behavioral and meta-mnemonic indicators of strategic behavior under remember instructions in first grade. *Child Development*, 1976, 47, 80–89.

Taylor, A. M., Thurlow, M. L., & Turnure, J. E. Vocabulary development of educable retarded children. *Exceptional Children*, 1977, 43, 444–450.

Turnbull, A. P. Teaching retarded persons to rehearse through cumulative overt labeling. *American Journal of Mental Deficiency*, 1974, 79, 331–337.

Turnure, J. E., Buium, N., & Thurlow, M. L. The effectiveness of interrogatives for prompting verbal elaboration productivity in young children. *Child Development*, 1976, 47, 851–855.

Turnure, J. E., & Thurlow, M. L. The effects of structural variations in elaborations on learning by EMR and nonretarded children. *American Journal of Mental Deficiency*, 1975, 79, 632–639.

Wanschura, P. B., & Borkowski, J. G. The development and transfer of mediational strategies by retarded children in paired-associate learning. *American Journal of Mental Deficiency*, 1974, 78, 631–639.

Winschel, J. F., Ensher, G. L., & Blatt, B. Curriculum strategies for the mentally retarded: An argument in three parts. *Education and Training of the Mentally Retarded*, 1977, 26–31.

Winschel, J. F., & Lawrence, E. A. Short-term memory: Curricular implications for the mentally retarded. *Journal of Special Education*, 1975, 9, 395–408.