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ABSTRACT

Research regarding the cognitive processing of students with learning disabilities, mild mental handicap, and emotional handicap is reviewed. In considering cognitive processing for students with mild mental handicap, research attention has been directed to the issues of memory and learning, acquisition and retrieval deficits, inefficient strategic plans, executive function, inadequate tactics and metastrategies implementation, production anomalies, and levels of processing. The following major topics have been addressed in cognitive processing research for students with emotional handicap: memory and learning, intellectual functioning, information processing, and levels of processing. The review found that there has been more research on cognitive processing of students with learning disabilities and mild mental handicap than on students with emotional handicap. The paper concludes that the argument used to support that students with mild disabilities have processing deficiency can also be used to suggest that they have neurological problems and structural differences. However, students' task performance can be improved with the appropriate use of learning strategies. (Contains 60 references.) (SW)

Cognitive Processing in Mild Disabilities

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RUNNING HEAD: COGNITIVE PROCESSING

ABSTRACT

Many research studies have been conducted in the areas of learning disabilities and mild mental handicap using the information processing models. These two areas have received more attention than the area of emotional handicap. Regardless of the various topics used to classify research in these three areas, the argument used to support that students with mild disabilities have processing deficiency can also be used to suggest that they have neurological problems and structural differences. However, students' task performance can be improved with the appropriate use of learning strategies.

Information processing models such as that of Atkinson and Shiffrin (1968) and Newell and Simon (1972) were mainly formulated to have a better understanding of how individuals without a disability process incoming information and solve problems, as well as an understanding of the stages that this information goes through before a response is made. As a result, an architecture of the human cognitive system has been established with distinguished characteristics for each part. For example, the structural approach has produced different components of memory such as short-term and long-term memory stores. If a problem in the cognitive system is due to short-term memory deficit, it can be ameliorated by using learning strategies. For example, Mayer (1987) recommended the use of strategies such as chunking, rehearsing, and organizing to help process information in short-term memory (see Chi, 1976). Developmental changes have also been studied with reference to their effect on memory. For instance, adults' memory is better than children's memory due to the adults' efficient strategies and rich knowledge base (e.g., Chi, 1976; Mayer, 1987).

Research using the "levels of processing" approach indicated that students' memory performance was enhanced when cognitive processing moved from shallow superficial levels to deep semantic levels (Craik & Tulving, 1975). The "levels of processing" framework was used with college students (Craik & Tulving, 1975; Nelson, 1977) and elementary school students (e.g., Lupart & Mulcahy, 1979; Walker, 1987; Al-Hilawani, 1994).

The purpose of this article was to review and classify research in the cognitive processing of students with learning disabilities, mild mental handicap, and emotional handicap.

Cognitive Processing and Students With Learning Disabilities

A number of research studies using the characteristics of the information processing models has been conducted with students with learning disabilities (see Swanson, 1987a). One of the main questions addressed in these research studies is the relationship of the learning disability to memory and learning, processing, structural, or automaticity features.

Memory and Learning. Chi (1976) suggested that children and adults do not differ significantly on the capacity and rate of information lost from short-term memory. However, the difference in memory performance between these age groups is in the use of rehearsal and grouping strategies. Chi summarized that children are deficient in processing strategies and processing speed, both of which result from a limited long-term memory knowledge base. This knowledge base is enhanced through age and cumulative learning. Reid and Hresko (1981) stated that the performance of students with learning disabilities on memory tasks tends to be similar to the normally achieving children of younger ages.

Reid and Hresko (1981) indicated that there is a general agreement in the literature that memory (short-term memory and long-term memory) is a problematic area for individuals with learning disabilities (see Cooney & Swanson, 1987 for a review). Research into ways of increasing the storage of information in long-term memory has suggested some factors that affect retention. These factors are the organization of the material, its relevance, labeling and rehearsal, questions, and presentation rate (Reid & Hresko, 1981).

Processing Deficiency. Torgesen (1982) indicated that some individuals with learning disabilities are deficient and passive in using mnemonic strategies. He found that individuals with learning disabilities often benefit

from adult-imposed strategies and structure, and they engage in these tasks if trained to do so (see Torgesen & Greenstein, 1982).

Bauer (1982), using information processing models such as the one proposed by Atkinson and Shiffrin (1968), suggested that learning and memory are composed of three stages. The first stage is attention to relevant information maintained by using strategies. The second stage is the use of elaborative encoding strategies, such as rehearsing, clustering, and reorganizing information. These strategies determine the amount of information retained and transferred to long-term memory. The third stage is that of long-term (permanent) memory. If elaborative encoding is efficient, information is transferred to the permanent memory store. Poor learning (lower recall and slower acquisition) in students with learning disabilities is not primarily due to inattention to information, sensory storage, long-term memory, or retrieval (recall or recognition of information), but to inadequate elaborative encoding abilities (rehearsing, clustering, and reorganizing information).

Ceci (1982) found that the difference between "normal" students and students with learning disabilities is in the use of learning strategies. He noted that both groups achieve comparably when their responses are automatic or involuntary. However, the difference arises in achievement in favor of "normal" students when both groups are required and expected to use learning strategies in conscious and deliberate learning. The researcher concluded that students with learning disabilities are developmentally immature in purposeful, active, and conscious learning and behave like non-disabled younger children on tasks that demand an active role from the learner. Subsequent studies (Ceci, 1983, 1984) revealed support to this conclusion. This finding may indicate that learning disability is likely to

result from a poor coordination of mental processes and strategies that should be used in order to successfully complete a task. Students with learning disabilities must formulate a plan from a repertoire of strategies to solve a problem (Swanson, 1987b).

Structural Differences. Baker, Ceci, and Herrmann (1987) believed that structural differences exist between students with language learning disabilities (L/LD) and those without disabilities (NLD). These differences are reflections of subtle aspects of the students' semantic system as compared to global ones (where L/LD students may perform comparable to NLD students on word association tasks). Baker et al. (1987) argued that differences in processing is not enough to account for language/learning disabilities deficiencies. They added that it is partially correct to say that either structure or process accounts for students with learning disabilities memory inefficiency or difficulties. Their position is that both semantic structure and process influence the performance on semantic tasks; the way semantic information is structured, which is qualitatively different for L/LD, influences processes that can be effectively used. It is assumed, therefore, that the structural differences between L/LD and NLD students may partially explain the memory deficient of L/LD students. In sum, Baker et al. indicated that students with language /learning disabilities and students without disabilities differ in the structure of semantic memory and the processes used.

Automaticity. Other research studies used the concept of automaticity to explain learning disabilities (e.g., Ackerman & Dykman, 1982; Samuels, 1987; Kolligian & Sternberg, 1987). Using concepts from a sub-theory of intelligence, Sternberg and Wagner (1982) assumed that many learning disabilities result from failing to automatize skills such as reading and mathematics. That is, students with learning disabilities devote much attention to skills which

normally achieving individuals have mastered long ago and have now become automatic. This attention to skills consume the resources which should be used to learn new skills or to advance to higher thinking skills or operations.

Similarly, Samuels (1987) said that one reason for reading difficulty is that the task of decoding written words consumes much attention, which in turn affects constructing meaning. In order to simultaneously decode and comprehend a given passage, the ability to decode words has to be automatic. Samuels mentioned that one of the characteristics of good readers is the ability to decode and comprehend at the same time during the reading process. However, poor readers use the letter as the unit of recognition in decoding words, which burdens the short-term memory and makes comprehension slow and laborious.

Levels of Processing. Research using the "levels of processing" framework (Craik & Lockhart, 1972; Lockhart & Craik, 1990) was a departure from the structural approach to studying human cognitive system. It delineated different levels of processing incoming information and their influence on memory performance. Two studies employing the "levels of processing" framework using students with learning disabilities and students without learning disabilities in various elementary schools were conducted by Walker (1987) and Al-Hilawani (1994). While Walker found that there was a significant difference between the two groups of students, Al-Hilawani found that there was no significant difference between students with learning disabilities and students without learning disabilities on the memory task. However, both studies found that stimulus words tapped semantically in congruent sentence frames resulted in a more durable memory trace which, in turn, improved performance on the semantically cued recall memory test

for these words. Furthermore, performance was maximized when the retrieval cues matched the encoding level (i.e., using semantic retrieval cues for semantic encoding tasks, and using intermediate level (rhyming) retrieval cues for intermediate level (rhyming) encoding tasks).

Conclusion. It is beneficiary for students and teachers to suggest that the problem with memory of students with learning disabilities is, in part, the result of difficulties in using control (psychological) processes (e.g., rehearsal, imaging, organization, problem solving, or any techniques used to remember information). Swanson (1991) stated the advantages of conceptualizing learning disability as processing deficiencies. He said that when focusing on strategy deficiency, the emphasis is on something modifiable and susceptible to instruction where the children are actively involved in the instruction process to determine which strategy is best for them to influence their learning behavior. The partial support for this indication is obtained from the findings that the difference between some students with learning disabilities and those without learning disabilities is lessened with training and instruction (see Chi & Gallagher 1982; Bauer, 1987 for a review).

One promising strategy technique is the keyword method (Cooney & Swanson, 1987). Scruggs, Mastropieri, and Levin (1987) reported the constructive outcomes from using mnemonics such as the keyword method that have been effective in enhancing the performance of students with learning disabilities. Moreover, Bauer (1987) viewed students with learning and reading disabilities as having deficient control processes. Bauer's rational for this view is that students who received training in control processes showed improvement in a short period of time on learning and memory tasks, and that the conceptualization of deficient control processes as fixed and unchangeable qualities is not supported. Also, Bauer argued that accepting the

proposition that brain disorder is responsible for problems in using control processes decreases the effort to find behavioral treatments and results in labeling students, unnecessarily, as brain damaged. He added that students with learning disabilities attained control processes but at a slow rate when compared to students without disabilities of similar age. Therefore, students with learning disabilities have not learned how to learn. The slow acquisition of control processes is responsible for inappropriate and inefficient use of control processes, lower awareness about control processes, and slow learning and poor memory. Bauer stated that since training in control processes improved students' task performance, the focus should be on training and improving those students' control processes (see Cornoldi, 1990 for a review).

Scruggs and Mastropieri (1990) provided an overview of some mnemonic strategies such as keywords, loci methods, pegwords, and others. They stated that mnemonics have positive effects on the performance of students with learning disabilities since they facilitate recall and comprehension of information. A mnemonic is defined as a method used to improve memory function. More specifically, it is a particular reconstruction of certain content in a way to link the new information with the individual's already existing knowledge and hence facilitate retrieval (Scruggs & Mastropieri, 1990).

Cognitive Processing and Students With Mild Mental Handicap

Baroff (1991) mentioned that there are two dominant theories in literature to explain mental handicap. The first one is the deficit theory which considers mental handicap due to impairment in cognitive abilities, such as memory. The second one is the developmental theory which regards mental handicap the result of slow cognitive development where individuals with mental handicap are forced to perform at a low level of mental development.

Memory and Learning. In any theory about mental handicap, the effect of memory on task performance should be considered. Memory is important in order to apply what is learned to a problematic situation. Efficient learning necessitates that individuals recall previous knowledge and use it in new situations (MacMillan, 1982). One of the characteristics of individuals with mental handicap is difficulty in school learning tasks. Those with mental handicap learn slowly and less than individuals without mental handicap. This is so since it is a manifestation of low intelligence (e.g., Baroff, 1991). Jensen (1989), explaining the connection between learning and intelligence, noted that they are not independent factors; both indicate the efficiency of working memory in processing information. Learning new material and intelligence share common cognitive processes and the general ability factor (i.e., Spearman's g factor), the basis for all cognitive abilities.

The memory performance of children with mental handicap is generally deficient when compared to children without mental handicap. It has been thought that the inferior performance of children with mental handicap is due to structural and/or functional (rehearsal strategies) deficiency, especially in the short-term memory store (see Ellis, 1963, 1970).

Acquisition and Retrieval Deficits. Belmont and Butterfield (1969) reviewed the literature on memory and stated that the development of short-term memory relates to the development of acquisition abilities, retrieval abilities, or to an interaction between acquisition or retrieval. The researchers studied the function of acquisition, retention, and retrieval processes in short-term memory. They argued that the deficient short-term memory performance in individuals with mental handicap is due to acquisition or retrieval elements, but not to defective retention.

Dulaney and Ellis (1991) stated that the deficit on short-term memory task in individuals with mental handicap is due to encoding and/or retrieval inadequacies. They also noted that short-term memory studies indicated that the difference between individuals with mental handicap and those without mental handicap is in the accuracy of recognition.

Inefficient Strategic Plans. Brown (1974) viewed defective short-term memory as a function of a general pattern of inefficient use of strategic plans (i.e., mnemonic skills) to organize, maintain, and attend to pertinent stimuli. The researcher pointed out that the primary element of inefficient memory performance of individuals with mental handicap may be their passive behavior in using appropriate and purposeful strategies in memory task situations. Brown indicated that deficient memory in individuals with mental handicap is not due to whether the presented task is one of a short-term/long-term nature, but rather the lack of adequate strategic transformation skills for its execution.

MacMillan (1982) reviewed the research on memory models in mental handicap. He stated that even though individuals with mental handicap have poor memories, the explanation for inefficient memory is not decisive (i.e., structural or functional problems). MacMillan reported the following elements that have been found in common among all models proposed to explain the inefficient memory function in mental handicap : Attention, organization of incoming information, selection of strategies such as clustering of information, short-term memory and the forgetting rate due to not rehearsing the presented information, rehearsal strategies used to aide memorization and transfer information from short-term memory to long-term memory, generalization of the learned task to new situations, and

retrieval (i.e., recalling the information from long-term memory and using it).

Executive Function. Butterfield and Belmont (1977) advocated understanding the so called "executive function" to remediate limitations in a child with mental handicap to make an active and planful approach to problems in information processing. The executive function oversees decisions regarding the flow of information (selective attention, rehearsal strategies, search in long-term memory, and recall of information). The researchers focused on the executive functions that organize control processes into strategies for information processing problems. Executive function is displayed when an individual changes control processes as a result of changes in the information processing task. Butterfield and Belmont (1977) stated that instruction in executive functioning prepares individuals to behave intelligently.

Inadequate Tactics and Metastrategies Implementation. Belmont and Mitchell (1987) regarded the difference among children with mental handicap and those without mental handicap in their task performance as due to differences in tactics (i.e., inadequate tactical implementation of strategies following strategy instruction which affected the accuracy of memory). Belmont and Mitchell indicated that children show different tactics which account for differences in performance. Belmont and Mitchell added that individuals with mental handicap fail to maintain and transfer strategies which may suggest that their problem is not in the use of strategy but rather in metastrategic processes, the higher order processes where strategies are put together, selected, and used when needed.

Production Anomalies. According to Bray and Turner (1987), it is incorrect to say that individuals with mental handicap are strategically deficient, as

implied in the term "production deficiency" (i.e., failure to use strategies) (see Brown, 1974). They indicated that there is a continuum of strategic behaviors which shows that individuals with mental handicap use strategies, contrary to what stated in the literature. Bray and Turner rejected the principle of "production deficiency" found in the literature about mental handicap because it is restricted to specific testing conditions. In Bray and Turner's opinion, what seems a production deficiency under certain task conditions may not be found under other task conditions. That is, performance deficiency is situation-specific and not a general failure to produce strategies. These researchers stated that the spontaneous use of strategies in individual with mental handicap depends on variables such as task difficulty, the constraints imposed on the behavior of those with mental handicap during research studies, the amount of explicit instruction for task performance which influence comprehension, and the context of the study which influences the purpose of remembering and the use of strategies. These variables will affect the use of strategies by individuals with mental handicap. Therefore, what seems to be a strategy deficiency under certain conditions may be better regarded as production anomalies. This is clear if different conditions for task performance are studied. That is, as Bray and Turner stated, failing to implement strategies is due to different situation-specific variables.

Levels of Processing. The view of memory performance as a deficiency in how information is processed in individuals with mental handicap is in line with the "levels of processing" framework (Craik & Lockhart, 1972; Lockhart & Craik, 1990). Lupart and Mulcahy (1979) found partial support for recall performance as a result of depth of processing in the following three experimental conditions: Incidental (i.e., describing the task without

mentioning the memory test), intentional (i.e., knowledge of the recall test), and planned intentional (i.e., using memory strategies and assessing task demands). All subjects (i.e., those with and without mild mental handicap) from fourth, fifth, and sixth grades exhibited improvement in performance over the three conditions as a result of depth of processing. The durability of memory is influenced by depth of processing. The superiority of semantic processing at the deep semantic level was noticed over both shallow superficial and intermediate acoustic levels. However, the difference between shallow superficial and intermediate acoustic levels was minimal in recall performance.

One interesting finding was the significant difference between incidental learning and learning outcome when memory strategies were used. No significant difference was found between intentional and incidental learning. Therefore, it is suggested that intention alone is not enough to enhance memory performance of children at this stage of mental development. Strategic planning is needed to improve recall significantly.

Children without mental handicap performed better than children with mild mental handicap. The two groups differed at the intermediate phonemic level and at the deep semantic level of processing. According to Lupart and Mulcahy (1979), levels of processing differentiated between the memory performance of subjects who have different IQ levels.

In a study using semantic encoding and rhyming encoding conditions, McFarland and Sandy (1982) found that the participants without mental handicap recognized more common one-syllable words than the participants with educable mental retardation (EMR). Also, in the semantic condition, where participants rated the pleasantness of words on a 5-point scale, individuals without mental handicap recognized more words than in the

rhyming condition, where participants produced words that rhyme with the stimulus words. The participants with mental handicap were equal in their performance to those without mental handicap in the rhyming condition, but they were deficient in the semantic condition. The participants without mental handicap retained more words in the semantic condition than those with mental handicap; however, this effect was not significant after a 24 hour period delay. McFarland and Sandy noted that the performance of both groups in their study was comparable more often than not.

Contrary to what McFarland and Sandy (1982) reported in their study, Dulaney and Ellis (1991) stated that individuals with mental handicap performed better on semantically encoded information during the recognition test than on information introduced at the shallow processing level. Dulaney and Ellis (1991) conducted a study with individuals with mental handicap and individuals without mental handicap on two types of processing, semantic (deep encoding) and non-semantic (i.e., shallow encoding). Using photographs of common objects arranged in a two-picture book format, the participants in the semantic condition were asked to name the objects in the pictures and to identify them. However, the participants in the non-semantic condition were asked to say loud the name of the objects in the pictures. On the recognition memory test, the researchers found that those in the semantic condition performed better than those in the non-semantic condition. Recognition accuracy for both groups decreased with time from zero delay to one day delay to one week delay. There was no difference between the participants with mental handicap and those without mental handicap at zero delay, and at one day delay in the non-semantic condition. However, those with mental handicap performed more poorly than those without mental handicap after one week delay on the non-semantic task. One

of the interesting findings was that those with mental handicap performed better in the semantic encoding condition than in the non-semantic condition. Dulaney and Ellis concluded that recognition memory can be improved in those with mental handicap by using semantic processing. The researchers noticed that participants without mental handicap performed the same regardless of whether the instruction was for semantic or non-semantic processings. The researchers' explanation was that those without mental handicap may encode items semantically all the time. They stated that individuals with mental handicap may perform like those without mental handicap if they are required to process the information at the semantic level. Dulaney and Ellis added that once information is encoded at the deep level of processing, the performance of individuals with mental handicap and those without mental handicap appeared to be similar on the long-term recognition memory. The researchers stated that individuals with mental handicap seemed to process information at a shallow level and less elaborately than individuals without mental handicap.

Schultz (1983) conducted a study using children with mild mental handicap and a group of MA-matched children without mental handicap to examine response time and accuracy on three different tasks requiring different depth of processing, according to Craik and Lockhart's (1972) framework. The author found no significant difference between the two groups when the subjects had to respond to three types of questions about the three levels of processing and the subsequent recognition test. However, it was found that children with mild mental handicap were progressively slower in encoding at the deeper (semantic) level of processing and require more time to respond than children without mental handicap (i.e., decision

time increased due to moving from shallow superficial, to intermediate acoustic, to deep semantic processing).

Probably the difference in the outcome of the two groups in Lupart and Mulcahy's (1979) and Schultz's (1983) studies is due to the type of memory task required (i.e., recognition vs. recall). For example, when using the recognition memory test in Schultz's study, the subjects were presented with the target stimulus as well as the distorters. The subjects' task was to find the target stimulus. However, in Lupart and Mulcahy's (1979) study, the subjects had to relay totally on memory to produce the answers with no clues provided to help recall the stimuli. However, the two studies emphasized the importance of deep processing in enhancing memory performance.

Boyd and Ellis (1986) compared the recall performance of "normal" subjects and two IQ levels (i.e., high vs. low) of subjects with mental handicap on pictorial stimulus tasks. The results supported the authors' prediction that deep processing (e.g., responding to questions such as "what are the objects in the pictures used for?") produced more recall than shallow processing (e.g., responding to questions such as "what are all the colors in this picture?"), regardless of IQ level. Deep semantic encoding was superior to shallow superficial encoding for all IQ levels. "Normal" subjects recalled more items than those with mental handicap. The high and low IQ groups with mental handicap did not differ in performance. The researchers attributed the difference in performance between the "normal" group and the group with mental handicap to elaboration and not to shallow processing of information by subjects with mental retardation. "Normal" subjects and subjects with mental handicap process the material at the same level but subjects with mental handicap are not elaborating within that specific level of processing even though the association produced by the subjects with mental handicap

for objects in the pictures were more semantic than acoustic. However, the associations were not as many as those produced by normal subjects. The memory of the subjects with mental handicap, unlike the memory of "normal" subjects, did not produce elaborate and complex associations of the pictures presented in the study. For example, "normal" subjects produced a greater variety of responses representing different aspects of the objects in the pictures, such as their function, their components, and gave category names (e.g., fruit) and exemplars (e.g., orange).

Generally speaking, the performance of children with mental handicap can be enhanced for a limited series of stimuli given instruction to semantically analyze information and given sufficient time for encoding (Al-Hilawani, 1994). This is important in order to improve their performance in the classroom (Schultz, 1983). Moreover, students with mild mental handicap need to use strategic planning (Lupart & Mulcahy, 1979) and receive explicit instruction to improve their performance (Schultz, 1983).

Cognitive Processing and Students With Emotional Handicap

After reviewing the literature it was found that very little research has been conducted in the area of intellectual ability and cognitive processing with students with emotional disturbances. The following are the major topics covered in this area of special education.

Memory and Learning. Paget (1982) indicated that the performance of children with emotional disturbances was poor on the long-term memory and short-term memory tasks of the WISC-R. The author attributed this poor performance to the probability of process deficits in one or a combination of encoding, storing, and retrieving information. Also, Lutz (1984) found that

individuals with emotional disturbances have difficulties in word retrieval and short-term memory for information presented auditorily.

Using overt rehearsal and free recall, Osborn and Neador (1990) compared a selected sample of nine to eleven year old depressed male subjects with a similar group of non-depressed male subjects. The researchers found that depressed children indicated short-term memory deficits, rehearsed less, and had less overall recall than non-depressed children. The depressed group rehearsed less because of diminished attention. However, using mnemonic instructions may improve the learning and retention significantly for students with behavior disorders (Mastropieri, Emerick, & Scruggs, 1988).

Intellectual Functioning. Winters, Stone, Weintraub, and Neale (1981) found in their study that children who have schizophrenic parents have lower verbal IQ than students with "normal" parents. Children of schizophrenics and depressives differed significantly from the control group on performance IQ.

Scruggs and Mastropieri (1986) noted that individuals with behavioral disorders and those with learning disabilities are similar with regard to intellectual functioning and cognitive characteristics (e.g., academic performance and being below average in their intellectual abilities).

Ysseldyke, Bakewell, Christenson, Muyskens, Shriner, Cleary, and Weiss (1988) indicated that cognitive ability explained the differences in achievement in reading for students with learning disabilities, educable mental retardation, and emotional disturbance when matched on academic engaged time. The cognitive factor (i.e., verbal IQ, performance IQ, and full scale IQ from the WISC-R) appeared to be consistent and more enlightening than other factors such as students motivation, behavior, home and family life, and others in explaining differences in students' reading achievement

when engaged time was held constant. Higher achieving students performed greater or equal to the lower achieving students on the cognitive measure.

Kinnison (1988) compared the cognitive performance of students in categories of learning disabilities, emotional disturbances, mental retardation, and others. It was found that students with learning disabilities had the highest IQ scores in verbal, performance, and full scale. Students with emotional disturbances had the next highest set of scores. The last group was students with educable mental retardation. Kinnison mentioned that students with learning disabilities and those with emotional disturbances scored within the average range. However, the majority of Kinnison's sample (74%) was students with learning disabilities. Further, there were very few students in other categories, and no complex statistical analysis was performed (see Al-Hilawani, 1994).

Mattison, Morales and, Bauer (1992) compared the performance of seriously emotionally disturbed (SED) boys and those who were evaluated for SED but recommended for different educational intervention. The researchers found no significant difference between groups on mean verbal, performance, or full scale IQs on the WISC-R. The overall mean scores were in the normal range. They also found that attention deficit disorder was high in both groups.

Kauffman, Cullinan, and Epstein (1987) stated that very little is known about the academic, intellectual, and behavioral characteristics of children with emotional disturbances. Information about achievement and intellectual abilities when compared to what is available about their behavioral characteristics (for example, internalizing vs. externalizing behavioral problems) is less certain. However, most students with mild and moderate emotional disturbances score slightly below average on IQ tests. A

disproportionate number, compared to the normal distribution, obtain IQ scores in the dull and mildly retarded range. A few score in the upper range; those with more severe emotional or behavioral problems have the lowest IQ scores (Hallahan & Kauffman, 1991; Kauffman, 1989) (see Kauffman, Cullinan, & Epstein (1987).

Information Processing. Relating information processing models and research on memory to emotional disturbances, Rehm and Naus (1987) proposed a description of depression. They stated that "affect" is an important element in encoding and retrieving information in both short-term and long-term memory. Information is stored with the affective states accompanying it. The individual's present affective states facilitate access to stored information and experiences that have similar affective quality. For example, when we are sad, we have the tendency to recall experiences that took place when we were in the same emotional state. The researchers noted that depressed individuals are emotionally biased when processing information. That is, they use their personal experience and negative self-evaluation in making subjective judgments. When it is in harmony with the current emotional mood, negative self-evaluation may seem correct. This biased evaluation happens when depressed individuals compare the present information to similar experiences from semantic based memory. The current mood will determine whether or not the information will be negatively processed by influencing memory toward negative semantic associations.

Hartman (1988) suggested that many children who have behavioral problems (e.g., hostility, aggressiveness, withdrawn, and others which are counterproductive to learning) may have an auditory processing disorder. According to Hartman, children who have this type of disorder are not able to meaningfully use information presented auditorily even though they have

normal hearing. This disorder takes many forms such as auditory discrimination for sounds or words and auditory memory problems for repeating input data or following directions.

Levels of Processing. Reviewing the literature revealed that one research study was conducted on this population using the theoretical "levels of processing" framework (Al-Hilawani, 1994). The statistical analysis indicated that "normal" students and students with emotional handicap performed significantly higher than students with mild mental handicap. However, the analysis did not reveal significant differences among "normal" students, students with learning disabilities, and students with emotional handicap. Nor were there significant differences between students with learning disabilities and those with mild mental handicap. The data on the memory test showed that the mean number correct for all students was the highest when stimulus words were presented and encoded semantically and retrieved using a congruent semantic cue. A mismatch between encoding processing conditions and retrieval cues produced poor memory performance regardless of levels of processing. The findings indicate that appropriate use of levels of processing, congruity, and encoding specificity for retrieval cues enhances recall of information.

Summary

Reviewing the literature showed that there is a wealth of knowledge concerning the cognitive processing of students with mild disabilities. The bulk of this knowledge is in the areas of learning disabilities and mild mental handicap. Emotional handicap was the least researched area. The research studies covered in this article indicated why some students have disabilities by studying their cognitive system and comparing it to the cognitive system of

students without disabilities. It is important to mention that the views in these studies overlap in explaining disabilities; and the same argument used to support that students with mild disabilities have processing deficiencies can also be used to suggest various types and degrees of neurological problems and structural differences when they are compared with "normal" students. However, the task performance of students with mild disabilities can be improved somewhat with the use of learning strategies, and when presenting, encoding, and retrieving the information semantically.

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