AN INVESTIGATION INTO THE EFFECTIVENESS OF TWO STRATEGY TRAINING APPROACHES ON THE READING ACHIEVEMENT OF GRADE ONE NATIVE INDIAN CHILDREN

by

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ABSTRACT

The purpose of the study was to determine whether instruction in specific cognitive strategies, based on an information processing paradigm, could affect the reading achievement of grade one Native Indian children. One type of strategies dealt with simultaneous and sequential processing which have been shown to improve achievement in older children. The other type of strategies dealt directly with development of specific reading strategies.

The study was basically an Experimental/Control by Pre/Post design. Three interventions were designed: teaching information processing strategies based on the Luria/Das model of information processing, teaching reading related tasks felt to improve linguistic awareness, a combination of the strategy and linguistic awareness programs. A fourth group was included to control for experimenter effect. All interventions were taught by certified teachers trained by the experimenter. The 36 subjects were taught in small groups for a total of 15 hours over three months. All continued to receive regular reading instruction in their classrooms.

No significant group effect was found on the overall reading measure. At both the pre- and post-testings the simultaneous processing scores were significantly higher than the sequential processing scores. No group effects were found on the information processing scores. The results showed a sex difference for information processing
style as well as differential performance between those children repeating grade one and those not repeating.

The results were discussed in terms of the effectiveness of the interventions for the age level of the subjects, the adequacy of the information processing measure (K-ABC) and possible reasons for the observed sex difference on this measure.
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DEDICATION

This dissertation is dedicated to the memory of my mother, Laura Helen Bryant. Her death at the commencement of this dissertation took much joy from life; it also committed me, as she had done, to "walk by faith, not by sight" (2 Corinthians 5:7).
CHAPTER ONE

INTRODUCTION

... (H)igh drop-out rates and school failure among Native children is pressing all educators to examine their approaches to Native education (Kaulbach, 1984, p. 36).

The failure of schooling among Native children is spectacular (McLeod, 1984). It is estimated that 85% of Native students leave school before completing grade 12 (More, 1984a). The achievement of Natives in school is further evidence of our failure to adequately meet their educational needs. Thomas et al. (1979) found average achievement levels to be two or more years behind grade placement. This disparity begins slowly in the first years of school. By the end of grade 1, one-third of Native children are already a year behind, having repeated kindergarten or grade 1, or taken three years to complete these grades (More, 1984a). By the end of grade 3 to 4 this achievement lag widens and becomes common across all subject areas (Coleman et al., 1966). By grade 8, 52% of Native students are at least one year behind grade placement (More, 1984c). One can only assume that the emotional and social effects of such failure are devastating, and can have lasting detrimental effects.
Our schools are under ever increasing pressure to improve the achievement of all students, particularly in the area of reading. Literacy trends in the United States over the past ten years indicated that younger readers made greater gains than older ones (Chall, 1983a). In spite of this, there are still significant numbers of children who experience difficulty in acquiring reading skills. This difficulty is exacerbated for Native children (Downing, Ollila, and Oliver, 1975).

Reading is a skill seldom mastered without direct instruction. Even with instruction, reading skills are learned slowly. The complexity of the reading act, and of processes needed in learning to read has led to continued research into both reading ability and disability. While reading research has burgeoned, a central issue still remains: why some children benefit more from reading instruction than others.

There have been numerous approaches to the study of reading, but few seem to be directed toward solving the practical problems of literacy (Chall, 1983a). Research addressing the efficacy of instructional approaches has long dominated the scene, only to show that a small part of the variance in reading acquisition is attributable to differences in curriculum (Bond and Dykstra, 1967; Calfee and Drum, 1978). While this approach continues to be researched, more theoretical and basic research is again being addressed (Chall, 1983a; Gibson and Levin, 1975).
Gibson and Levin (1975) suggest that the development of different processing strategies is essential in learning to read. The strategy approach may be stated in terms of adaptive rules or strategies, created by the cognitive functioning of the individual which are felt to enhance performance in reading (Marshall, 1979) and which are believed to be teachable. In reading research one approach to studying strategies is being researched through the concept of linguistic awareness (Mattingly, 1972, 1979, 1984). In cognitive psychology, strategies are being researched through information processing theories as they relate to achievement, as well as through metacognition (Flavell, 1977, 1985). The former tends to be concerned with specific, sometimes perceptually based, microstrategies for processing materials (Biggs, 1984). The latter tends to be concerned with more general, macrostrategies of information processing and its subsequent effect on reading achievement.

In research literature both approaches have been individually taught in attempts to improve academic achievement and, in particular, reading. Likewise, both approaches have generally been successful for the samples studied. However, a direct comparison of the efficacy of teaching both approaches has not been attempted, particularly with Native children. The present study addresses this issue through the teaching of strategies based on the Luria/Das model of information processing.
(Das, Kirby, and Jarman, 1975, 1979), and linguistic awareness tasks from the reading literature.

Purpose of the Study

The major purpose of this study was to investigate the extent to which two types of interventions, based on different strategy training approaches, had a facilitating effect on the early reading achievement as well as the simultaneous and successive information processing scores of Native Indian children. The first type of training intervention was based on the simultaneous and successive model of information processing (macrostrategies). The second type of strategy training used linguistic awareness tasks from the reading related literature (microstrategies). A third intervention combined the two types of strategy training interventions. The specific research hypotheses and strategy training interventions are presented after the literature review in Chapter Two.
CHAPTER TWO

REVIEW OF THE LITERATURE

The transition to a new paradigm is scientific revolution (Kuhn, 1972, p. 90).

Cronbach (1957) signalled for a paradigm shift in the field of intelligence (Das, 1984a). This shift away from psychometric definitions of abilities to one based on processes is becoming apparent in recent conceptualizations of intelligence. As the influence of this newer conceptualization of intelligence is felt in other disciplines, they too begin to change. In educational research one effect of this shift is the analysis of academic performance as an interaction between aptitude and treatment (Cronbach, 1975). Information processing models of intelligence are providing a needed framework for educational research.

Educational performance is beginning to be defined in terms of information processing theories. These models have common basic concepts, although terminology used to describe these concepts differ (Hunt, 1980; Sternberg, 1983; Wagner and Sternberg, 1984). Cognition is generally analyzed into at least two components; one for processing of incoming information, the other for monitoring, selecting, and controlling these processes. A third
component, metacognition, is sometimes included to deal with reflective knowledge of cognitive processes (Flavell, 1977; Lawson, 1984). Cognitive processes are involved in the encoding, transforming and storing of information. The controlling system is seen as using strategies in performing its envisioned function. These strategies may be general or specific, and may involve the use of many processes in carrying out an operation (Kirby, 1984a).

Educators are now attempting to define educational performance in terms of cognitive processes. These processes are viewed as skills which are believed to be teachable. Research is now being directed towards teaching cognitive processing skills in an effort to affect academic achievement. While the process approach is not a panacea, it does provide a more realistic framework with which to attack educational problems (Kirby, 1984a).

Strategies play a prominent role in this newer conceptualization. Strategies can be conceptualized as broad, global ways of ordering incoming information (e.g., cognitive style), or they may be very task specific and thus less transferable across tasks. Training attempts have focused at both levels. Training in the use of a general or macrostrategy for efficient processing of types of information may increase efficiency across tasks, but not necessarily specific task performance. Training in the use of specific microstrategies, while seen as necessary for successful individual task performance, may not generalize to other tasks (Biggs, 1984).
The review of the literature relevant to the study is presented here largely within the framework of this newer paradigm of information processing. The review is divided into two major sections: information processing research and metalinguistic research. The information processing review first presents the cognitive abilities of Native Indian children. The Luria/Das model of information processing is then described and the cognitive abilities of Native Indian children re-interpreted within this model. Reading achievement research is also described in terms of the Luria/Das model. Lastly, within the information processing section, the use of strategies and interventions are reviewed. The second section of the literature review presents the metalinguistic awareness research with reference to both the theoretical and practical aspects, as well as intervention attempts at training the development of metalinguistic awareness.

The Cognitive Abilities of Native Indian Children

Much of the earlier research on Native Indian children's cognitive abilities was done within the psychometric model of intelligence (Wagner and Sternberg, 1984). In order to understand the strengths and weaknesses of group performances, various measures related to, and predictive of school success were administered. The underlying ability manifested in these measures was
believed to be largely unchangeable, rendering pointless any interventions based on them (Kirby, 1984b).

The Wechsler Intelligence Scale for Children (WISC) and the WISC-Revised (WISC-R) have been the most commonly employed instruments in this line of research investigating the cognitive abilities of Native Indian children. Native children typically show a significant discrepancy between verbal and nonverbal abilities, with the verbal abilities being lower than those for whites, and the nonverbal abilities being equal to or above those for whites (Conrad, 1974; Cundick, 1970; Deissner and Walker, 1986; Fraser, 1969; Hynd, Kramer, Quakenbush, Conner, and Weed, 1979; McShane, 1983; McShane and Plas, 1982, 1984; Peck, 1972; Sachs, 1974; Sattler, 1982; St. John, Krachev, and Bawman, 1976; Seyfort, Spreen and Lahmer, 1980; Thurber, 1976).

Attempts have been made to further analyze WISC and WISC-R results based on subtest profiles to determine if a distinct pattern emerges. McShane and Plas (1982) used Bannatyne's factor scheme and found Spatial scores to be greater than Sequential scores which were greater than Conceptual and Acquired Knowledge scores. Reschly (1978) factor analyzed WISC-R standardization data for Papago Indians not living on reservations. He found two-factors sufficient for the data; the verbal scale subtests except Digit Span, and performance scale subtests except Coding. McShane and Plas (1984) reported factor analytic results based on a sample of Ojibwa children living on reserves.
They found a three-factor solution. The first consisted of Information, Similarities, Vocabulary, and Comprehension, and has been found to exist for other groups of children. This factor is commonly named Verbal Comprehension (Kaufman, 1979). The second consisted of Information, Similarities, Arithmetic, Vocabulary, Digit Span, and Block Design, and was tentatively named Automatic Verbal Processing. The third consisted of Block Design, Object Assembly, and Mazes, and was thought of as Spatial Processing. Coding was not related to any factor, as in Reschly's results. Although McShane and Plas (1984) sought a two-factor solution, they could not confirm Reschly's results. Zarske, Moore, and Peterson (1981) factor analyzed WISC-R results of diagnosed learning disabled Navajo and Papago Indian children. They found a two-factor solution similar to Reschly's. Zarske and Moore (1982) subsequently studied a group of 452 Navajo children grouped as educationally disadvantaged, learning disabled, and regular classroom students. The pattern of WISC-R subtest results that emerged was the same as that of McShane and Plas (1982): Spatial greater than Sequential greater than Conceptual.

Scaldwell, Frames and Coolson (1985) studied WISC-R subtest patterns to determine if the 'Native' pattern emerged. Their sample consisted of 81 Oneida, Chippewa and Muncey Native children 7 to 13 years of age. All children attended small community reservation schools. The Oneida
Natives (N=18) had been referred due to learning difficulties. Analysis of WISC-R results indicated the Verbal IQ was not significantly lower than Performance IQ. This was felt to reflect acculturation of the sample, and the use of English as a first language. Recategorization of WISC-R subtests displayed the Bannatyne (Bannatyne, 1976) profile (Spatial > Sequential > Conceptual and Acquired Knowledge), with only the Spatial factor significantly different from the others. The 'Native' pattern of Spatial greater than Sequential greater than Conceptual was not found. The authors suggested that the pattern of the spatial high and the sequential factor much lower may reflect simultaneous versus successive information processing as reported by Krywaniuk and Das (1976).

None of the reported factor analytic studies reported a Freedom from Distractability factor or found Coding to relate to any factor. The Freedom from Distractibility factor in other groups has been interpreted as a behavioral rather than an intellectual construct (Kaufman, 1979; Reschly, 1978). This may be interpreted two ways for Native children. It may be that in Native children the WISC-R factors represent only intellectual constructs. On the other hand, it could reflect the opposite. That is, the Verbal-Performance differences evidenced by Native children on the WISC-R may be interpreted in terms of behavioral constructs, specifically for Native children.
The reason for lack of a Freedom from Distractibility factor has not been discussed in the literature, except to suggest the need for further research using a variety of Native groups.

The research on Native cognitive abilities tends to overgeneralize results. This is apparent in the research cited above in which factor-analytic WISC-R results of Ojibwa children living on reserves were compared with results of Navajo and Papago learning disabled children, and Papago children not necessarily living on reserves. The results may in fact represent the difference between living on a reservation versus not living on a reservation. In either case, much of the research using Native samples has overgeneralized results to bands and to Natives in general without addressing differences between Native groups (Vernon, 1984).

The performance of Native children on the WISC and WISC-R differ from other groups and the standardization group. Native children's performances have been shown to demonstrate a curvilinear relationship between age and IQ. School entry marks a rise in measured ability and continues until about grade 3, whence scores drop (Peters, 1963). This period from 7 to 9 years seems to be critical for the growth of cognitive skills and achievement (Flavell, 1985). The sharp increase in school difficulties at about age 9 years has been referred to as the 'crossover' effect (Saslow and Harrover, 1968).
The consistency of findings based on the WISC and WISC-R results as well as other tests has led to suggest an Indian learning style (Kaulbach, 1984; More, 1984c). More (1984c) reviewed a number of bipolar distributions of characteristics which are closely related to the verbal-performance discrepancy of interpretations in Kaufman (1979). Native Indian children have evidenced relative strengths in the following areas: visual-spatial, field independent, simultaneous, relational, and nonverbal. Relative weaknesses include the following: auditory, field dependent, successive, analytic, and verbal.

The analysis of Native cognitive strengths and weaknesses framed within the old paradigm of intelligence and based on a psychometric conceptualization has not been particularly relevant to educators. Ability within this paradigm, as indicated from testing, has thus been viewed as a deficit, and something to be worked around. Education was therefore keyed to the strengths of the learners. In the case of Native Indian children learning was seen as most effective when they learned through visual means (Havighurst, 1970; Hynd & Garcia, 1979; Kaulbach, 1984; Kleinfeld, 1970).

Instruction keyed to a child's perceptual strength will considerably enhance and facilitate his ability to learn. Conversely, those taught without any regard for individual differences in learning style may experience great difficulty and even face school failure if they lack the strategies to efficiently process and retain information presented in a particular manner (Kaulbach, 1984, p. 27).
However, if Native children are to successfully compete in schools, they need stronger linguistic skills, for "power lies in language" (Kaulbach, 1984, p. 27).

**Luria/Das Model of Information Processing**

Information processing conceptions of intelligence commonly view intelligence as the way in which people process and mentally represent intelligence (Wagner and Sternberg, 1984). Information processing provides a framework for many models of mental processes and strategies. Luria (1966a, 1966b, 1973) has studied the cerebral bases of psychological processes. He identified and investigated their functional systems that operate as a result of interactions between differentiated brain structures. These functional systems, while being localized, are also integrated according to the processing demands of a particular task. Luria (1973) stressed that the functional systems of co-jointly working cortical zones are not independent structures, but rather are formed in the course on each individual's development in response to social influences (Klich and Davidson, 1984).

Luria divides the brain into three basic functional units or blocks. These blocks are interrelated systems involved with arousal, coding and planful behavior (Das, Kirby, and Jarman, 1975, 1979).

The first block of the brain is concerned with arousal. This functional unit includes the brain stem,
reticular formation and hippocampus. It is responsible for regulating the energy level and tone of the cortex both exciting and inhibiting. This unit can seriously affect the functioning of the other blocks of the brain, and in turn is affected by the higher centres.

The second functional system, or Block 2, is concerned with obtaining, processing and storage of information. This unit is situated in the posterior parts of the cortex, and includes the occipital, temporal, and parietal lobes. It is organized hierarchically into primary projection areas, secondary association areas, and tertiary overlapping areas. The primary projection area receives information and analyzes it into elementary components. The secondary association areas further organize and code the material. The tertiary areas are particularly important as they receive information from all modalities, and form the basis of complex behavior. Block 2 is regulated by the principle of diminishing modal specificity, so that the primary areas are more modality specific than the tertiary areas. This functional system also demonstrates increasing functional lateralization.

Information within Block 2, particularly in the tertiary areas, is integrated using simultaneous and/or successive synthesis. Simultaneous synthesis is processing by integration into a quasi-spatial gestalt, with all parts being immediately surveyable and relatable (Kirby, 1980b). Simultaneous processing takes place in the
occipito-parietal zones, and is involved in both verbal and nonverbal tasks. Successive synthesis is the integration of information into a temporal sequence such that each element exists only as part of a retraceable sequence. Successive processing takes place in the fronto-temporal area of the brain.

The third functional system is responsible for planning and programming behavior. It is located in the frontal lobes, and uses the motor cortex as an outlet channel. As in the other blocks of the brain, Block 3 is divided into primary, secondary, and tertiary zones. The most important part of Block 3 is seen as the prefrontal region which is involved in the organization of conscious activity of behavior (Luria, 1973). The frontal lobes are also connected with the reticular formation, as mentioned earlier.

Poor performance on achievement and ability measures within this model may be due to either a mediational deficiency or a production deficiency. The former implies a Block 2 function in which simultaneous or successive coding is impaired. The latter implies a Block 3 function in which the processing ability is intact but inefficiently used (Das, Kirby, and Jarman, 1979). To date, the latter has been assumed in intervention attempts, and planning level programs attempted. Kirby (1984b) feels there is good reason to be optimistic about the benefits of such intervention programs, but warns that there is "no cause to anticipate miracles" (p. 75).
Native Cognitive Abilities Within the Luria/Das Model

The major implication of the Luria/Das model applied to the cognitive performance of other cultural groups is that "we are unlikely to find cultural group differences in basic component processes" (Cole and Scribner, 1974, p. 193). Rather, observed behaviors are felt to reflect differences in coding strategies used in task completion. This new paradigm has led to addressing the processing strengths and weaknesses of Native Indian children rather than abilities, and examining alternate means of relevant instructional approaches based on the Luria/Das model (Sternberg, 1983). A reframing of observed cognitive abilities of Native children within the new information processing paradigm is briefly discussed below by independently examining the three functional systems.

Block 1: Arousal Level

The first functional unit, as discussed, is concerned with cortical arousal and alertness and is influenced by the two other blocks of the brain. The level is seen as being closely associated with the sensory registration of external stimuli. The modality strengths and weaknesses, as described earlier, would seem to be closely related to this level of the model. The general concensus from modality research would indicate that Native Indian
children show strength when dealing with visual tasks and relative weakness on auditory tasks (McShane and Plas, 1984).

Comparison between auditory and visual modality strengths and weaknesses of Native Indian children have been reported in studies using the Illinois Test of Psycholinguistic Abilities (ITPA). The evidence is consistent with a pattern of relative strength in visual modality versus relative weakness in auditory modality (Garber, 1968; Lombardi, 1969; Taylor and Skanes, 1975; 1976). For example, Garber (1968) administered the ITPA to 110 Navajo and Peublo first grade children. The findings of this testing program revealed that these children were able to remember visual symbols, manipulate pictures and designs and understand relationships which involved visual associations much better than they could handle the auditory modality tasks. Lombardi (1969) demonstrated similar results after testing Papago Indian children.

Taylor and Skanes (1976) also administered the ITPA to a sample of Inuit and white children in isolated communities in Labrador. They also evidenced the same visual modality strengths and auditory modality weaknesses as reported for other Native Indian children. As they state:

These children (Inuit) score the lowest on the following subtests: auditory associations, verbal expressions, grammatical closure and sound blending and particularly poorly on three of these. The (Inuit) children score better than the typical
Laborador white subjects ... on visual reception, visual sequential memory, visual association and visual closure (Taylor and Skanes, 1976, p. 37).

The white children did not evidence significant differences between the two modalities and were superior to Inuit children on all auditory tasks.

Kaulbach (1984) suggests caution in interpreting these results since the ITPA auditory subtests confounds verbal ability in English with auditory perceptual skills. He further indicates that "it is too premature to imply from these results alone that Native children are deficit in their ability to conceptualize through language" (Kaulbach, 1984, p. 130).

McShane and Plas (1982, 1984) provide more direct support for an auditory modality weakness in Native children. They suggest that the prevalence of otitis media disease among these children has a profound effect on their educational attainments, as evidenced on auditory tasks. The evidence of an auditory modality weakness amongst Native children is tentative and confounded by verbal factors, however, there is consistent evidence of visual modality strengths on a variety of cognitive tasks.

Researchers have demonstrated a relative visual modality strength using a number of measuring instruments. Representative tests include:

1. WISC scales (Cundick, 1970; McAreavy, 1978; Peck, 1972; Peters, 1963; Thurber, 1976),
2. WISC-R scales (McShane and Plas, 1984 for a review of this research),
3. Goodenough Draw-A-Man Test (McCatin and Schill, 1977 for a review of this research),
4. Raven's Progressive Matrices (MacArthur, 1968a, 1968b), and a ...
5. Variety of visual tasks such as Memory for Designs and Visual Short-Term Memory (Krywaniuk, 1974).

Kaulbach (1984) suggests that Berry's (1966, 1976) cognitive style research may explain Native Indian children's visual modality strengths in terms of their exposure to an observational learning environment. The literature on both past and present Indian and Inuit societies is replete with suggestions that the learning environment of these children nurtures and reinforces visually acute perceptual skills (Cazden and John, 1971; Kleinfeld, 1970; Klick and Davidson, 1984; More, 1984b; Vernon, 1984).

The work of Berry (1966, 1971, 1976, 1982) in cross-cultural psychology has helped to test the generality of psychological laws. Berry, along with other collaborators, has developed a theory of culture and cognitive style. This work suggests that through a combination of techniques of socialization specific skills such as visual-spatial skill are welded into a characteristic mode of functioning found throughout an individual's cognition.
Vygotsky (1978) in a similar approach, postulated a "general law of cultural development." Vygotsky argued that ontogenetic functioning must be considered from a phylogenetic perspective. Vygotsky's position is succinctly summarized by Luria:

In order to explain the highly complex forms of human consciousness one must go beyond the human organism. One must seek the origins of conscious activity and 'categorical' behavior not in the recesses of the human brain or in the depths of the spirit, but in the external conditions of life. Above all, this means that one must seek these origins in the external processes of social life, in the social and historical forms of human existence (Luria, 1981, p. 25).

It is within this connection that Vygotsky proposed his law of cultural development.

Any function in the child's cultural development appears twice, or on two planes. First it appears between people as an interpsychological category, and then within the child as an intrapsychological category. This is equally true with regard to voluntary attention, logical memory, the formation of concepts, and the development of volition (1981, p. 163).

One implication that can be drawn from Vygotsky's general law of cultural development is that visual-spatial functions appear twice. In the early years visual-spatial functions appear as observational learning (Kaulbach, 1984), and then as the child develops, cognitive styles (Berry, 1966). The same would be true for auditory-linguistic functions. First, they appear as verbally mediated learning (Barclay and Hagan, 1982) and then as verbally regulated behavior (Schubert, 1983; Schubert and Cropley, 1972).
Vygotsky (1978) further suggests that socialization influences the organization of children's learning styles in four ways. First, it arranges for the occurrence of specific problem-solving situations. Kaulbach (1984) has reviewed studies suggesting that the learning environment of Native children provides both observational and verbally mediated problem-solving tasks. Second, the frequency of the tasks is organized. For Native children, exposure to observational learning tasks is considered to occur more frequently in their homes. Third, culture shapes the patterning of the co-occurrence of verbally mediated learning in connection with observational learning tasks, which is rare for Native children (Greenbaum and Greenbaum, 1983). Lastly, socialization provides control over task difficulty.

The Native children's learning environment, based on the foregoing factors, has been characterized as providing frequent observational learning and problem-solving without verbal mediation. Kaulbach summarizes this learning environment as:

... nonverbal in nature. The children learn the customs and skills of their society by sharing directly in the activities of others. In such situations, verbal instruction is neither offered nor required because the child's close proximity to the observational action makes instruction-giving redundant .... (I)n those infrequent instances where verbal instruction is used, the ... adult generally calls attention to the observable aspects of the situation... (1984, p. 33).
While this quote once again shows the tendency to overgeneralize results to include all Native people, Vernon (1984) has noted some results from different Native groups in diverse parts of Canada to be very similar.

The link between interpersonal styles of socialization and intrapersonal styles of learning (cognitive style) seems to receive theoretical support. Within this framework of the Luria/Das model, Native children could be characterized as controlling Block 1 attentional processes by a cognitive style, a Block 3 or planning function. This point will be returned to later when the planning level of the model is discussed.

Block 2: Coding Level

Das, Kirby and Jarman (1979) describe the function of what is often referred to as the coding level.

The second functional unit is involved in obtaining, processing and storing information... As in all units, a hierarchical arrangement of cortical areas exists in this unit. The primary projection zones receive information and analyze it into elementary components. The secondary or projective association zones further organize the material and code it. The tertiary zones where information from various sources overlaps are essentially amodal. They are organized to form the basis of complex behavior (Das, Kirby, and Jarman, 1979, p. 39).

It is within this functional block that most abilities are measured. The Wechsler scales can be considered coding level tasks (Naglieri, Kamphaus, and Kaufman, 1983). The old paradigm of intelligence, largely based on norm-referenced tests, resulted in an often unstated
assumption that the underlying skills or abilities measured by the tests were innate, and largely unimprovable (Kirby, 1984b). The new paradigm attempts to redefine performance by addressing the underlying cognitive processes, skills, and strategies postulated as necessary for successful performance. Thus poor performance is seen as largely due to sub-optimal or insufficiently developed strategies (Das, Kirby, and Jarman, 1979; Kirby, 1980b).

Various explanations of performances measured at the coding level have focused on a number of components. Two of these are differences in simultaneous and successive processing associated with coding and retrieval of information, and the use of language in performing tasks. Native children appear to differ from their non-Native counterparts in both of these components.

The relative strength in perceptual, mnestic and conceptual visual behavior evidenced by Native Indian children is associated with a specific pattern of processing strengths and weaknesses. Simultaneous processing tasks used to date are usually non-verbal in nature (Kirby, 1984b; Das, 1984e). The observational learning environment described earlier would seem to enhance the development of a relative strength in simultaneous processing in Native Indian children (Klich and Davidson, 1984). Conversely, a relative weakness in successive processing should be shown due to the poor reinforcement schedule provided by the learning environment.
Krywaniuk (1974) compared low achieving grade three and four Cree children to high and low achieving white children. Mean WISC-R Performance IQ's did not significantly differ between the groups. The mean Verbal IQ of the Cree children was significantly lower than that of the white children. This discrepancy is consistent with other results reviewed earlier.

Krywaniuk also administered a battery of tests designed to measure simultaneous and successive synthesis. Results of the principal component factor analysis on performance of the groups indicated different factor loadings. These results suggest that Native children approach some tasks in a different manner to white children. For example, in his sample the Native children approached the Raven's Progressive Matrices using successive processing, whereas this test was processed simultaneously by the white children. This test has been shown to load simultaneously in other studies (Das, Kirby and Jarman, 1979; Jarman, 1978). Krywaniuk's results also indicated that when verbal content (e.g., free and serial recall tasks) was present his samples of low achieving Native children demonstrated difficulty in successive processing. This led Das, Kirby and Jarman to reason:

How does one account for the similarity of performance on simultaneous processing, but difference in successive processing between the white and native children? Further, how does one interpret the differences in factor loadings? One
may argue that since the white and native children had comparable WISC Performance IQ, and since WISC-P is akin to simultaneous, they are not expected to differ on the usual simultaneous tests. However, the simultaneous tests did not behave in the usual manner in terms of factor loadings for the native data. Similarly one may argue that since one group was higher than the other on WISC Verbal IQ, these differences on successive tests would be expected. Again a simple inference such as this will be in error: Color Naming and Cross-modal Coding are not verbal in the sense of serial recall of words. Perhaps we should understand that native children have not learnt to use successive processes effectively ... But let us accept that the native children are less prone to using successive strategies appropriately (1979, p. 130).

Thus Das, Kirby and Jarman feel that the level two functions are intact, but are ineffectively used. This is seen as a planning level or Block 3 function.

Recent studies using the Kaufman Assessment Battery for Children (K-ABC) (Kaufman and Kaufman, 1983) with Native children support the conclusion of ineffective use of successive processes. The K-ABC defines intelligence in terms of an individual's style of solving problems and processing information. Its Mental Processing scales are partially based on the Simultaneous-Successive processes outlined in the Luria/Das model and have been validated against the original battery of Das, Kirby and Jarman (1979). The test was specifically designed to minimize the role of language for successful performance. The K-ABC, like the WISC-R, can be considered a coding level measuring instrument (Das, 1984d, 1984e).
The authors of the K-ABC report two reliability and validity studies conducted with North American Native children: Brokenleg and Bryde, 1983; and Naglieri, 1983. The first study administered the K-ABC to 20 male and 20 female Sioux children who were integrated into white society and spoke English well. This sample did not show a significant verbal/performance discrepancy on the WISC-R, nor between the K-ABC's Simultaneous and Sequential Processing Scales.

The second study (Naglieri, 1983) administered the K-ABC to 14 male and 19 female Navajo children who lived in an isolated reservation and who spoke primarily Navajo. All were tested by a Navajo examiner. This group scored significantly higher on the Simultaneous than Sequential Processing Scale.

Kaufman and Kaufman (1983) in discussing the results of these studies state:

The Sioux and Navajo groups earned virtually identical mean standard scores on the Simultaneous Processing and Non-verbal Scales ... Their subtest profiles on these scales were highly similar: both groups scored above 10 on Gestalt Closure, Triangles, and Spatial Memory and below 10 on Matrix Analogies, Photo Series, and Hand Movements. Their strength was in visual-spatial abilities; they showed less well developed skill in integration of sequential and simultaneous processes and reasoning (Kaufman and Kaufman, 1983, p. 153).

Kaufman and Kaufman go on to note that both Number Recall and Word Order on the Sequential Processing Scale were performed poorly by the Navajo group. They feel this
may reflect their limited proficiency in English, since both subtests require good verbal comprehension skills.

More (1984b) also administered the K-ABC to Native and non-Native children. His main sample consisted of 32 white and 32 Native children. All the children were 10 years of age. He found that the Native children were weaker in sequential processing than the white children, but equal in simultaneous processing. When the subtests were factor analyzed two factors, simultaneous and sequential, emerged for the white children. For the Native sample a single factor, simultaneous, emerged indicating an over-reliance on simultaneous processing regardless of task demand.

In order to understand the nature of the difficulty Native Indian children experience on verbal successive tasks, verbal processing needs to be briefly addressed. Linguistic functioning within the Luria/Das model relates both to simultaneous and successive forms of coding, and also to third block functioning. Successive processing is implicated in both receptive and expressive use of contextual grammatical structures (Cummins and Das, 1978). Simultaneous processing is clearly implicated in comprehension of and performance on logical grammatical constructions (e.g., taller than, brother's father). Within this model then, successive processing is seen as related to performance on linguistic tasks which require either analysis of the sequential linear structure of the input or syntactically mature expressive speech.
Simultaneous processing is seen as related to performance on linguistic tasks requiring grasping of quasi-spatial conceptual relationships (Cummins and Das, 1978). These relationships appear to hold for adults and in older children (Cummins and Das, 1977).

However, at younger age levels when these semantic systems are just beginning to emerge, this relationship may not hold. In fact, the prerequisite skills for the processing of linguistic input are likely to be more dependent on successive than on simultaneous processing. In children who have difficulties in successive processing, this may be especially so .... Thus children who are characterized by a deficit in successive processing may experience a lag in the differentiation of deeper levels of conceptual-linguistic abilities from more elementary or surface forms of sequential-linguistic processing (Cummins and Das, 1977, p. 253-254).

It is suggested that Native children demonstrate difficulty in successive processing tasks using verbal content such as the K-ABC Word Order and Number Recall subtests, both of which restrict linguistic processing to sequential prosessing (Keith and Dunbar, 1984).

The investigation of language functioning and processing has mainly been clinical. Jakobson (1971), Luria (1981), and Pribram (1971) have suggested that dysfunctions tend to fall into two varieties: syntagmatic and paradigmatic. The former disrupts successive cognitive processes and the latter simultaneous processes.

The study of paradigmatic/syntagmatic word associations in normal subjects offers insights into the development of linguistic functions and simultaneous-
successive processes. Central to much of this research has been the syntagmatic/paradigmatic shift. This is characterized by a fairly consistent finding that children younger than 7 to 8 years of age tend to produce syntagmatic word association (e.g., horse-runs), whereas older children produce paradigmatic associations (e.g., horse-cat) (Jarman, 1980; Luria, 1981). This again suggests that younger children are more dependent on successive processing (Cummins and Das, 1978; Das, 1984c).

Although the relationship between syntagmatic/paradigmatic language processes and simultaneous-successive processing in general has been established in neuropsychological research, only recently has this relationship been investigated in normal populations as a dimension of individual differences. Cummins and Das (1978) demonstrated paradigmatic free associations loaded on a simultaneous factor in a sample of children with a mean age of 105.3 months. Cummins and Mulcahy (1979) provide limited evidence that nominative and predicative functions of language are related to simultaneous and successive tasks respectively.

More direct evidence for the relationship between syntagmatic/paradigmatic language processes and successive-simultaneous processes in general was supplied in two studies reported by Jarman (1980). In the first study, he administered two clustering tasks as well as three tests each of simultaneous and successive processing. The
syntagmatic clustering task consisted of twelve words, with the first and last used as filler words, an example being chair-sit. The paradigmatic clustering task was identical in format but the words were different, an example being sheep-lamb. The words within each task were randomly positioned, and read to the child. The child's tasks were to recall the words orally. In children with a mean age of 7.6 years the syntagmatic clustering task loaded with successive processing tasks, the paradigmatic clustering task loaded with simultaneous processing tasks.

The study was repeated using older children (9 years of age), and longer lists of words. As in the younger children, the paradigmatic clustering task loaded with simultaneous tasks. The syntagmatic task loaded with the successive tasks, but the loadings were negative. Jarman (1980) was prevented from a clear interpretation of the results due to methodological weaknesses.

No direct evidence on the performance of Native children on syntagmatic/paradigmatic processing tasks has been reported. Indirect support comes from interpretation of other cognitive measures. Based on these it is suggested that Native children prefer a visual cognitive style and when able to use it, are proficient in both simultaneous and successive processes. On successive tasks requiring coding of verbal materials, Native children appear to function lower than non-Native children.
Block 3: Planning Level

The functional system of the brain is involved in the organization of conscious activity through the programming, regulation, and verification of behavior (Luria, 1973). "Intelligence is not merely a matter of concept formation, it is also a matter of planning" (Schubert, 1983, p. 73). Based on research reviewed, Native children appear to regulate and plan behaviors non-verbally rather than verbally. This is largely seen as a consequence of their learning environment.

At the planning level, Native Indian children evidence a cognitive style, "or a sequence of cognitive operations that are selected by the individual in response to a problem situation" (Das, Kirby and Jarman, 1979, p. 140). Within the Luria/Das model, attention may be controlled by the planning level. Visual search patterns have been used as measure of planning (Kirby and Ashman, 1982), and based on Native competencies, visual-motor problem solving is well-developed. The auditory-vocal problem solving skills are less well developed.

Achievement levels of Native children may be a reflection of this cognitive style. The 'crossover' effect or declining achievement at about grade three may in fact reflect the Native children's inability to shift from predominantly visual-motor problem solving acceptable at
primary educational levels to predominantly auditory-vocal problem solving in higher grades. This was alluded to in More's (1984b) factor analytic results of 10 year old Native children's K-ABC results.

Communication patterns of Native children further suggest that these children favor non-verbal regulation of behavior (Greenbaum and Greenbaum, 1983). Support for this interpretation comes from a verbal regulation of behavior study conducted by Schubert and Cropley (1972) among Canadian Native and non-Native children.

In this study Schubert and Cropley studied northern rural Native and white children living closer to a white urban centre. These children were given the WISC and verbal regulation of behavior tasks. Subjects ranged in age from 6 to 11 years. The WISC results were consistent with other WISC studies: higher Performance than Verbal IQs. The Native children who scored below 70 differed from white children with similar IQs; they had significantly higher verbal regulation of behavior scores. As the authors summarize:

The major difference between the northern Indian child and the urban child looks to lie in the fact that the former does not habitually and spontaneously analyze his experience in verbal terms and does not formulate internalized rules that might guide him in new learning situations (Schubert and Cropley, 1972, p. 300).

Schubert (1983) reported on a similar study done by Steinberg (1974/75) using Canadian Native children aged 6 to 16 years of age who lived on a reservation close to a
white urban centre. The results of the verbal regulation of behavior tasks indicated that the younger children (6 to 8 years) increased in their scores, whereas after 8 years of age no significant increase was seen. The younger children's scores were similar to the white age mates. However, all subjects in the older group did not progress beyond the level of discovering a rule but unsystematically explaining the rule. Based on an earlier study, this was interpreted as a retardation in the articulation of verbal regulation of behavior.

These children have not developed the kinds of information-processing strategies which are necessary to function adequately in a Western educational system (Schubert and Cropley, 1972, p. 301).

The Native cognitive style reflects a global visual approach as adapted from their environments, one which has not tended to rely on verbal regulation of behavior (Schubert, 1983).

Luria (1981) concluded from his studies that all higher mental activity is largely based on verbal processes. The formulation of sign systems that mediate human activity was a major theme in Vygotsky's (1979) and later, Luria's work. Within this framework the mediational aspects of language play a dominant role in what is termed the second signal system. Second signal system learning, as described below, has largely been studied through verbal regulation of behavior from a developmental perspective. The main point from this line of research is that young
children (4 to 5 years) begin to evidence a shift from external to internal speech and become more analytical. Luria (1981) generally found that by 6 to 7 years of age children predominently used silent speech to analyze situations, and used this internal speech to form rules to control behavior. The use of speech has been identified with the development of the second signal system. However, it is not identical with human speech. This system may develop without verbal language and the development of syntactical speech may also develop somewhat independently from verbal regulation of behavior. It is suggested that without adequate ability to form sentences, there is no verbal regulation or conscious thought (Schubert, 1983).

Vygotsky (1981) saw the final stage in concept development as the emergence of scientific concepts. This was seen as developing concepts in response to the requirements of formal instruction. Learning thus takes place through the use of language and not through the use of direct referents or concrete objects (Wertsch, 1983).

Verbal processing is important for planning level functioning. While language is not seen as creating processing, it is seen as a means of transforming and reorganizing pre-existing processes. As noted previously, the second signal system may develop without verbal language.

Native children have been shown to use the second signal system but are poor at consistently generalizing the
verbal rules for actions. They showed similar performance to white children up to about 8 years of age. As the demands for higher level linguistic processing were required in task completion, their performance did not improve as did that of the white children. This age once again coincides with that noted in achievement level studies showing the 'crossover' effect, and suggests an over reliance on visual-global cognitive style planning functions.

**Reading Achievement Within the Luria/Das Model**

Reading is a language dependent task and requires both simultaneous and successive processing of information. Both semantics and syntax are important in reading, as in language comprehension, and are respectively related to simultaneous and successive processing, as reviewed earlier. Individual differences in reading performance appear to be related to simultaneous and successive processing in a developmental fashion (Kirby, 1980a). On global reading achievement measures, less competent readers have been shown to rely on successive processing, which is what they are poor in (Doehring, 1968; 1978; Leong, 1980; 1982). Further evidence of this is seen in poor sequencing ability and poor use of syntactic cues. As reading ability increases readers rely upon and need simultaneous processing (Kirby, 1980a; Kirby, 1982a, 1982b; Kirby, Moore and Cousins, 1979; McLeod, 1978).
In the early stages of learning to read, successive processing has been seen as critical (Das, Snart and Mulcahy, 1982; Kirby, Moore and Cousins, 1979; Leong, 1982; Torgesen, 1978). In acquiring reading skills decoding and the use of graphic cues are important (Golinkoff, 1978; Kaufman and Kamphaus, 1984; Kaufman, N.L., 1980).

Simultaneous processing is implicated in higher levels of skilled reading (Kaufman and Kaufman, 1983). At these levels semantics, conceptual knowledge and verbal reasoning become prominent, and have been shown to rely on simultaneous processing (Brailsford, 1981; Cummins and Das, 1977; Das and Cummins, 1981; Das, Kirby and Jarman, 1979; Ryckman, 1981).

Further support for the importance of particularly successive processing and reading achievement comes from the study of reading disability. Much of this research was conducted from within the old paradigm of measuring perceived abilities. It is not the purpose of this review to deal with this massive body of research, but rather to briefly indicate general and consistent trends within it.

Early research tended to rely on modality specific interpretations of test results. Such areas as visual perceptual difficulties (Orton, 1925), auditory perception and memory difficulties (Liberman, Shankweiler, Liberman, Fowler and Fisher, 1977) and cross-modal transfer (Birch, 1962; Birch and Belmont, 1964) have all been investigated. More recent research has gone beyond the modality specific
approach to look at other basic deficits. Serial recall or sequential memory has thus been widely researched (Aaron, 1982; Doehring, 1978; Hynd and Cohen, 1983; Rourke, 1976, 1983). Recently Vellutino (1979) and Vellutino and Scanlon (1982) have reviewed much of this earlier research, and posited that reading disability may be due largely to a verbal processing deficit.

Syntactic and semantic language processing are addressed in Vellutino and Scanlon's (1982) interpretation of reading difficulties. Identifying words relies in part on syntactic competence. Words not only relate semantically (e.g., cat-animal), but also on the basis of grammatical relationships similar to syntagmatic associations (e.g., cat-runs). Word identification in context therefore, not only relies on a correct semantic production, but also one which is syntactically appropriate. Vellutino and Scanlon (1982) propose that word identification depends to a large degree on normal syntactic competence. They see any degree of syntactic impairment as detrimental in developing phonological awareness required in beginning readers, but also in more mature readers when syntactic order of words within sentences is important.

This view does not ignore the finding that word identification can be done phonologically (successively) and/or directly (simultaneously). It does suggest that:
children who employ one route exclusively will be significantly impaired ... It is possible that some children who are mildly impaired in syntactic growth would not acquire phonological processing abilities, which is also an important prerequisite for normal progress in beginning reading (Vellutino and Scanlon, 1982, p. 237-238).

Children using a direct approach for word identification (i.e., whole word) while evidencing comprehension in the beginning stages of reading, also eventually need to use syntactic ordering of words within a sentence for comprehension. At some point syntactic-sequential processing needs to commence, whether at the stage of a word, phrase or sentence (Aaron, 1982). Therefore children relying on a direct access for word identification are seen as needing syntactic processing in order to adequately cope with intermediate level and beyond reading tasks.

Native Performance Within This Conceptualization

The academic achievement of Native Indian children may be interpreted within this language processing framework. In the early grades these children, while slower to master reading skills, are nonetheless generally able to read adequately. It is at about grade 3 to 4 that serious difficulties emerge: the 'crossover'. In the primary grades it is suggested that many Native children rely on their preferred mode of processing information, their visual, simultaneous cognitive style (Kaufman and Kaufman, 1983; Kaulbach, 1984). This circumvents syntactic-
successive processing by mediating words directly, as gestalts (Aaron, 1982). This is acceptable in the early grades. However, as the demands of the reading task shift to meaning, in part based on the syntactic order of words within a sentence, these children begin to experience difficulty (Aaron, 1982; Chall, 1983b). The semantic-simultaneous word recognition demands of the task can be done by their preferred mode of processing, however; weaker syntactic-successive processing is seen as impairing performance.

The Use of Strategies

The Luria/Das model offers one means for interpreting performance on intelligence and achievement measures. Unlike previous paradigms, it also provides a logical foundation for instructional design (Sternberg, 1983). Within this model cognitive functions can be improved. Interventions within information processing models, and in particular the Luria/Das model have focused at primarily the planning level. Efforts have centred on teaching strategies for processing information either successively or simultaneously, and for focusing attention.

Strategies are methods for approaching tasks. The strategy system is seen as responsible for setting goals, selecting and constructing strategies, and monitoring performance ( Kirby, 1984b). Strategies may be global, or free from academic content (Das, 1984c). Such
macrostrategies are defined as the general way in which a person orders and relates data on a particular task (Biggs, 1984). The cognitive style of Native children is thus a macrostrategy for dealing with information processing. Strategies may also be specific or task-related (Das, 1984c). Biggs (1984) refers to these as microstrategies. These strategies, unlike macrostrategies, do not transfer to different non-related tasks; they are task specific.

Strategies may also differ in the degree to which they are established. Strategies which are well-established, or habitual, require little thought for producing when processing information. Constructing a new strategy requires more processing before it becomes established. This dimension of strategies is referred to as automaticity, and is included in many information processing models.

**Intervention Within the Luria/Das Model**

The use of global strategy training has been the focus of remediation within the Luria/Das model. Krywaniuk (1974) used this approach in his intervention study. He found, among other things, that in his sample of low achieving grade 3 and 4 Native children, their factor analyzed test performances loaded differently to what is normally found in non-Native samples. As quoted earlier, Das, Kirby and Jarman (1979, p. 130) suggest the results to indicate that the Native children had not learned to
effectively use successive processing, probably because it is not the preferred mode within their culture. Krywaniuk devised a training programme to improve mainly successive processing. After 15 hours of intervention, the children had improved in successive strategy use as well as in decoding, which relies on successive processing (Cummins and Das, 1977).

Two other training studies have been reported. Kaufman (1978) trained average and below average grade 4 white children. Both simultaneous and successive processing strategies were taught, with an emphasis on successive. This group showed improvements in not only successive and simultaneous processing, but also in reading and arithmetic. Brailsford (1981) taught mainly simultaneous processing strategies to grade four children who were reading disabled. Again, the children improved in simultaneous and successive information processing when compared with a control group. They also improved in reading comprehension, which has been shown to rely more on simultaneous processing.

In a separate study, Lesak, Hunt and Randhawa (1982) taught simultaneous processing strategies to classrooms of children. The main purposes were to determine if average grade four children could benefit from a program to improve simultaneous processing, and if this would result in improved academic achievement scores. The results showed no significant improvement in simultaneous processing
compared to the control group. However, there were significant gains in reading and arithmetic for the experimental classrooms. This suggested that the children used the deployment of learned strategies to improve academic performance.

The intervention studies would seem to indicate that strategies can be successfully taught and more importantly, can improve academic achievement (Das, Kirby and Jarman, 1979).

The research of Das and his colleagues into the Luria/Das model has largely relied on two techniques. The first involves the use of marker tests, as referred to previously. The Ravens Progressive Matrices has been identified with simultaneous processing; serial recall with successive processing. Other tests are included in their 'battery'. Results of the testing are, in many cases, factor analyzed to determine construct validity for simultaneous and successive processing, and theoretical support for processing of specific tasks for specific groups of subjects. From a research perspective, dealing with groups of subjects, this has been a viable technique for addressing concerns regarding the Luria/Das model. In situations where this was not possible, the assessment of simultaneous and successive processing was difficult to determine. While the processes can be isolated for groups of children, individual determination of simultaneous and successive processing has not been directly addressed within this literature.
The recent introduction of the K-ABC has overcome this problem to some extent. This test measures intelligence from an information processing perspective: that of simultaneous and sequential processing. Kaufman and Kaufman (1983) state that the K-ABC is not a Luria-based test, but that the two mental processing scales, represent two types of mental functioning that have been identified independently by cerebral specialization researchers ... by Luria ... and his followers, ... and by cognitive psychologists (p. 2).

In spite of this statement, the test has been associated with the Luria/Das model (Bracken, 1985; Das, 1984e; Sternberg, 1984). Criticisms have been directed at not only its adequacy of measuring the processes in individual cases, but also the interpretation of obtained results.

The construct validity of the K-ABC has been particularly studied, since the test was designed to measure two theoretical constructs. Kaufman and Kaufman (1983) report many validity studies in the testing manual. Kaufman and Kamphaus (1984) reported the results of a factor-analysis of K-ABC subtests for the standardization sample. The principal-factor analysis results of the Mental Processing subtests across all the age levels yielded two robust factors. The authors concluded there was clear-cut support for the existence of the simultaneous and sequential constructs. They further addressed the issue of factor loadings of the subtests across the age
levels, and found the subtests to load on their designated factors except for Hand Movements. This particular subtest loaded sequentially up to age 5, and then loaded about equally on both factors through age 12 1/2 years. They acknowledged the developmental trend for this subtest. They also examined three and four factor rotated solutions. For certain age levels (4, 5, 6, 11 years) a third factor consisting of Triangles and Gestalt Closure was evident. Other three factor solutions were sought, but proved to be inconsistent, with little clinical meaning. Subsequent confirmatory factor analytic research has provided further support for the two-factor processing model (Kamphaus and Reynolds, 1984; Keith, 1985; Keith and Dunbar, 1984).

Keith and Dunbar (1984) and Keith (1985) investigated the construct validity of the K-ABC using the standardization data of the 5, 7 and 10 year olds. They found a rotated two-factor principal factor solution for the Mental Processing Composite subtests, with some inconsistencies. The Hand Movements subtest, as noted by Kaufman and Kamphaus (1984), loaded simultaneously in the 5 year olds. Word Order had a small but meaningful loading on the simultaneous factor for the 7 year olds, while Photo Series loaded sequentially for their age group (Kaufman and Kamphaus, 1984, p. 15). Overall, the factor structure found was consistent with the constructs of the K-ABC. However, the authors felt these factors could also reflect nonverbal reasoning (simultaneous) and verbal memory
(sequential). Hand Movements could be done nonverbally, reflecting its simultaneous loading, or using verbal mediation, reflecting its sequential loading. This interpretation thus considers the developmental trend observed for this subtest.

Das (1984e) has reviewed the K-ABC. Two main concerns were raised. First, Das noted that the K-ABC seems to assess only the coding level in the Luria/Das model, largely ignoring the attention and planning levels. Bracken (1985) and Sternberg (1984) also raised this point. In reply, Kaufman (1984) pointed out that the K-ABC is not solely a Luria/Das test, but rather is based on two processing styles that have been identified by various researchers, of which Luria is but one. Further to this point, Kaufman (1984) felt that a number of the subtests do require vigilance and planning, notably Photo Series and Triangles. A second major concern raised by Das (1984e) was that the K-ABC does not provide for scoring a performance based on strategies used by a child. In fact, the subtests are factor analyzed and said to measure processing, rather than how the child actually performs the task (Sternberg, 1984). However, Das and his colleagues have followed a similar approach through the use of their battery and marker tests. When the results from testing are factor analyzed in a research situation, it is possible to address how tasks were actually performed. As Gunnison (1984) and Kaufman (1984) suggested, in a clinical setting,
this is not possible, and must be determined from observation and interpretation of a child's performance.

To date, support has been shown for the theoretical structure of the K-ABC. Results of initial studies suggest that both exploratory and confirmatory factor-analysis support Kaufman and Kaufman's (1983) results and also indicate some inconsistencies (Keith, 1985; Keith and Dunbar, 1984). The manual for the test is very complete. Discussions of the K-ABC have all indicated it to be a promising test, needing further research to establish its usefulness (Bracken, 1985; Das, 1984a; Gunnison, 1984; Gunnison et al., 1982; Kamphaus and Reynolds, 1984; Keith, 1985; 1986; Keith and Dunbar, 1984). As Das states, "As a standardized measure of processes it may not be perfect, but it is all we have got" (1984a, p. 237).

Generalization of Strategies

The intervention studies reported, and which used small groups of children, have shown generalization of strategy training to academic achievement. This is viewed as largely due to the use of verbal mediation used during strategy training (Das, Kirby and Jarman, 1979). The verbal system, as shown earlier, is seen as a major means for not only controlling attentional processes (Barclay and Hagan, 1982; Kirby, 1982a; Luria, 1981; Torgesen, 1981), but also for facilitating the transfer of learning by developing general strategies for learning (Brailsford, 1981; Schubert, 1983; Wertsch, 1983).
The work of both Luria (1981) and Vygotsky (1978) indicates that cognitive development is marked by the transition from non-mediated, concrete thinking to abstract and verbally-regulated thinking. Higher-order associations are felt to be directly related to the development of a symbolic language system (Vygotsky, 1962). This development is seen as a direct result of both social and cultural events (Luria, 1981). The work of Feuerstein (1979) and Flavell (1977, 1978, 1981) also dealt with mediational use of language.

Strategy training not only teaches specific strategies, but also how to use the strategies. This is viewed as accomplished through verbal mediation. The teaching of strategies assures that the children have effective information processing skills. The use of verbal mediation while performing the strategies is seen as a means of ensuring the maintenance and generalization of the strategies (Barclay and Hagan, 1982).

Research attempts have been made to train the use of different global strategies. Likewise, different samples of children have been taught these strategies. Representative of these studies is the memory work of Flavell (1977, 1981) with normal children; Torgesen (1978, 1980, 1981) and Feuerstein (1979) with learning disabled children; Brown and Campione (1982) with retarded children; and Meichenbaum and Asarnor (1979) with children with
behavior problems. Keogh and Glover (1980), in reviewing the generality of the various strategy training approaches, noted that

individual differences in cognitive and language maturity are also likely influences in the appropriateness and effectiveness of cognitive training interventions (p. 79).

They noted that while verbal mediation techniques have been successful with children as young as 4 or 5 years of age, they are typically used with older children. Younger and impulsive children were found to use private speech which was not particularly task-relevant.

Krywaniuk (1974) found that global strategies could be taught to low achieving grade three and four Native children. The use of language was encouraged in his interventions, and his results indicate that it was effective in controlling attention and generalizing results. In younger children, particularly Native children, this may not prove to be the case. Although by 6 to 7 years of age many children have acquired the language necessary for this type of intervention, Native children of the same age may not. As Schubert (1983) found, while Native Indian children could perform a task age appropriately, they had difficulty verbalizing the rule. Likewise, the available research into cognitive abilities of these children suggested that they use a global non-verbal cognitive style to mediate behaviors, as reflected in their environment.
The fact that global strategy training was effective with older Native children is important. This suggests that these children already had the processing and language skills necessary to do the tasks. The training provided strategies which helped to organize this existing knowledge. Younger children may not possess either the language skills to ensure some generalization or the necessary skills to perform the strategies. In the latter case the training may be developing specific skills rather than training efficient means of processing information. In the case of simultaneous and successive strategy training, it has been assumed that these coding processes are intact and training is aimed at planning level strategies for their task appropriate performance (Das, Kirby and Jarman, 1979; Das, 1984b; Das and Jarman, 1981). In the former case, it has been previously suggested that proficiency in language may not be to a level where it serves to regulate behavior (Barclay and Hagan, 1982; Keogh and Glover, 1980; Schubert and Cropley, 1972). While older Native children were able to benefit from such a program, it remains to be seen if success can also be shown with younger children. Research with atypical children has shown encouraging strategy training results however, the Luria/Das model was not the focus of the research. Kirby (1984b) feels that macroplanning skills such as cognitive style may be resistant to change without the use of specific task contexts. Thus the use of macrostrategies is seen as one means by which to alter microstrategies.
Metalinguistic Awareness Review

Introduction and Theoretical Considerations

Metalinguistic knowledge or linguistic awareness involves the ability to focus attention upon the form of language in and of itself, rather than as the vehicle by which meaning is conveyed (Ryan, 1980). The ability to focus attention on language per se is seen as developing gradually with cognitive abilities. Understanding of spoken language focuses on meaning, with little regard for the acoustic forms of language (Ryan and Ledger, 1984), whereas written language requires analysis and manipulation of language forms in order to extract the meaning. Within this definition the importance of reflective awareness of language is stressed, and is seen as developing along with the child's increasing reflection on and control of intellectual functions. Both of these points are not necessarily identified nor accepted in the literature (Lawson, 1980).

Reflective awareness, the 'consciousness of being conscious', is central in much metacognitive research. Vygotsky (1962) viewed this as largely the result of formal schooling.

It is precisely during early school age that the higher intellectual function, whose main features are reflective awareness and deliberate control, come to the fore in the developmental process (Vygotsky, 1962, p. 90).
For Vygotsky and Leontev (1981), a child may be aware of language and focus upon it momentarily, but this is not synonymous with true conscious awareness. Conscious awareness requires not only the "ability to make language forms opaque" but also to "attend to them in and for themselves" (Cazden, 1974). Thus the child is seen as needing to be aware of the language forms and also indicate mastery and control of them. Children must learn to focus their attention on the forms of language.

Learned consciousness is seen as the result of actively being aware of the units of analysis, and acting upon this awareness (Brown and DeLoache, 1978). This point will be returned to later.

Language awareness may be viewed as developing through three stages (Valtin, 1984a). The first involves the automatic use of language within a communication situation. The second level is also seen as largely speech related. Children have 'actual awareness' of language and can abstract from the action and the meaning context to think about the form of language. Knowledge about language units is still implicit. At this stage, children may manipulate language, but this is not viewed as a conscious activity. Both Elkonin (1973) and Luria (1976, 1981) stress that a child needs to isolate the word from its meaning in order to have conscious awareness. Tunmer and Herriman (1984) discuss the same point:
Although linguistic intuitions involve metalinguistic abilities, they must not be equated with them. This is an especially important point to bear in mind in the evaluation of studies concerned with the development of metalinguistic abilities in children. It is entirely possible, for example, that children are able to perform metalinguistic operations without being able to provide explicit, adult-like judgements about language structure and function (p. 14).

Thus, while children may be able to tell if two words rhyme, they cannot produce rhymes on request. The third stage is seen as conscious awareness, in which the child can deliberately focus on and manipulate linguistic units. This knowledge is explicit, and viewed by some as dependent on formal instruction (Donaldson, 1978; Leontev, 1981; Vygotsky, 1962).

Mattingly's (1972, 1979, 1984) view of linguistic awareness is in sharp contrast to this outline. He feels that linguistic awareness is not a matter of conscious awareness, but rather of access to the certain aspects of linguistic activity. Thus he states:

the primary linguistic activities of speaking and listening are natural in all normal human beings, secondary linguistic activities ... are parasitic on these primary activities, and require "linguistic awareness," a specifically cultivated metalinguistic consciousness of certain aspects of primary linguistic activity. I still believe this distinction to be a valid one, but I now think that linguistic awareness is not a matter of consciousness, but of access. This access is probably largely unconscious, the degree of consciousness is not very relevant (Mattingly, 1984, p. 9).
Mattingly (1972, 1979, 1984) views language as innately given, and thus during the period of active language learning, grammatical knowledge is highly accessible to children who possess linguistic awareness. He does not posit the need for consciousness and thus additional cognitive abilities. While Mattingly (1972) originally created interest in reading circles by his use of the term 'linguistic awareness', his conceptualization is not presently one of the more seriously regarded formulations for the term presently in use.

Language ability is viewed as necessary in most conceptualizations, needed in conjunction with some other reasoning or cognitive abilities. Analyzing linguistic awareness with reference to cognitive factors requires differentiation of three aspects (Watson, 1984). The child must be able to focus attention on language forms per se (Donaldson, 1978; Cazden, 1974; Ryan, 1980; Pratt and Grieve, 1984a; Ryan and Ledger, 1984). The child needs to acquire the concepts of oral and written language such as 'word', 'sentence', etc. (Downing, 1982; 1984). The child needs the ability to deliberately use the structures of language.

In order for a child to focus on language per se the effect of cognitive development and schooling is seen as important. A number of researchers view the development of metalinguistic awareness as related to more general changes in cognitive development. Hakes (1980) related the
development of metalinguistic ability to Piaget's concept of decentration of thought. He wrote that the metalinguistic ability required in linguistic tasks "is the same ability as that whose development underlies the emergence of concrete operations" (Hakes, 1980, p. 100). This conceptualization is similar to the results of studies of metacognitive knowledge in several other areas, although not necessarily tied to Piaget's theory (Brown, 1982; Brown and DeLoache, 1978; Flavell, 1977, 1981). The fact that the concepts of written and oral language the child acquires are not part of the natural consequence of cognitive development or language development requires one to consider the cause and effect of schooling in the development of metalinguistic awareness.

Vygotsky (1962, 1981) and Leontev (1981), as mentioned earlier, view the conscious awareness of thinking, and in particular, metalinguistic awareness, as related to formal schooling. Donaldson (1978) feels that learning to read brings about an increase in metalinguistic awareness. Ehri (1980, 1984) views schooling and cognitive development as interacting to affect linguistic awareness. The concepts of linguistic units children require are mainly the result of literacy. Less developed cultures and illiterate adults do not show the same level of linguistic awareness as more literate cultures. Likewise, children may vary in their ability to use linguistic awareness as reflected in the performance of poor readers (Downing, 1984; Downing and
Leong, 1982). Thus specific metalinguistic awareness is specific to cultures and to the effects of schooling.

The separation of the acquisition of concepts of written language and the ability to deliberately utilize this knowledge is also debated. Vygotsky (1962) does not separate the two, feeling that "the control of function is the counterpart of one's consciousness of it" (p. 90). Ryan and Ledger (1984), as cited, distinguish between the awareness and the control aspects. This is in line with more recent information processing models and allows for an explanation of metalinguistic performances (Lawson, 1980; Pratt and Grieve, 1984a, 1984b; Watson, 1984). The act of reflecting on language is seen as a consequence of and distinct from control of cognitive processes. Metalinguistic awareness is domain specific; cognitive control processes may generalize across domains (Lawson, 1984). At present the research indicates a relationship between cognitive processing and the use of strategies with metalinguistic performances. The relationship between explicit metalinguistic knowledge and performance is not clearly established. These are confused in the literature.

The distinction between general cognitive control processes and knowledge-based cognitive control processes can be framed within the Luria/Das model of information processing. As presented earlier, strategies for either general information-processing or task-specific strategies are a Block 3 function. The global strategies,
macrostrategies, can be taught as general ways of processing information. The latter, microstrategies, can likewise be taught in relation to specific task performances. The former are felt to generalize more easily to other task performances, whereas the latter do not.

Linguistic awareness research has tended to focus on task-specific knowledge and strategy training. In this literature there is little controversy over the existence of the important relationship between linguistic awareness and reading. There is controversy over the reasons for the relationship, as summarized earlier (Watson, 1984). Not only is there controversy over the reasons for this relationship, but also as to the appearance of linguistic awareness performances and whether they emerge in sequence or synchronously. If one tends to view the emergence of metalinguistic awareness as contingent upon the development of metacognition, or the ability to control intellectual processes, then synchronicity is implied. This does not mean, however, that the rate of development for each is equal (Tunmer and Herriman, 1984). The work of Flavell (1977) and Rozin and Gleitman (1977) suggest an order for the emergence of metalinguistic abilities, although they disagree as to the sequence. Rozin and Gleitman (1977) hypothesize the order of emergence to reflect depth of processing, with deep representations being easier to access than surface ones. This sequence has been
researched within the reading literature (Ehri, 1980, 1984; Ehri and Wilce, 1985; Gough and Hillinger, 1979; Mason, 1980). While other viewpoints are apparent in the literature, at present no clear-cut interpretation or conceptualization exists. Commonly studied metalinguistic competencies include word awareness and phonological awareness.

**Word Awareness**

A fully developed word awareness is seen as involving three components. These are awareness of the word as a unit of language, awareness of the word as an arbitrary phonological label, and comprehension of the metalinguistic term word (Bowey and Tunmer, 1984). These three aspects of word awareness are believed to develop independently (Tunmer, Bowey and Greive, 1983).

The child's first task in acquiring reading skills is to realize that one spoken word corresponds to one written word (Ehri, 1975). This is generally assumed to exist when children enter formal reading instruction. But in order to do this the child must possess the logical prior notion that the flow of speech that has been produced and interpreted unreflectingly for years is, in fact, composed of words (Donaldson, 1978). Research raises doubts about this assumption. First, in speech there is no simple physical basis for detecting words, there are no spaces between spoken words as there are between written words.
Second, Ehri (1975, 1979) argues that children focus on the meaning of words in context, and not on structural relationships between words. Third, she sees that most words rely on other words for their meaning. In learning to read children need to develop the phonological realization of words, which for almost all words except concrete nouns, depends on words in meaningful contexts.

The key question in this area of research is whether beginning readers are aware that utterances consist of words. The recent research reviewed by Bowey and Tunmer (1984), Ehri (1984) and Blachman (1984), would suggest that children are not. Children 6 to 7 years of age experience difficulty segmenting words within sentences (Ehri, 1975, 1979; Francis, 1973; Hall, 1976; Holden and MacGinitie, 1972; Lundberg, 1978; Templeton and Spivey, 1980).

Downing, Ollila and Oliver (1975) found that children in kindergarten and grade one do not have a clear understanding of the term word. The youngest children in their sample over-estimated the concept of 'word' but that this was less in older children.

A commonly used paradigm in this research has been to have children listen to sentences, and to represent each word spoken with a token or tap. Grade one children score at about 50 percent using this paradigm (Evans, Taylor and Blum, 1979). When feedback is provided, kindergarten children were able to perform the task for nouns, but had difficulty with function words (Ehri, 1975; Holden and
MacGinitie, 1972). The problem with using sentences is one of memory load while trying to segment words. This may have confounded the results, although the ability to segment aural word boundaries is significantly related to reading achievement (Evans, Taylor and Blum, 1979).

Three studies have shown that young children can successfully segment word strings into words. Fox and Routh (1975) avoided the problem of using the term 'word' by asking the children from 3 to 7 years of age to say "just a little bit" of a spoken utterance. Sentences ranged from three to seven words in length. Using this procedure they found that 4 year old children could segment seven of the eight test sentences, whereas the 3 year olds could segment five. Fox and Routh were able to get the children to segment to individual words by requesting further segmentation if a phrase was given in response by the child. They did not request segmentation beyond the level of a word. The results are felt to directly reflect experimental procedure, rather than evidence that young children can segment sentences into words.

Tunmer and Bowey (1981) did three experiments investigating factors affecting young children's ability to segment speech. They used word tapping as the response mode. Words used were all one syllable, thus avoiding syllabic stress as a clue. They found that 4 year olds could segment 73 percent of the word strings, while first graders performed at the 90 percent level. Children were
most accurate with strings containing verbs and quantifiers.

Tunmer, Bowey and Grieve (1983) investigated the use of syllabic stress as a basis for responding to the word tapping task. They found that the high scores in their previous study may have reflected the use of a syllabic stress strategy in word tapping by some of the children.

They also investigated segmentation of strings containing compound words and meaningful two and three word strings. Analysis of the results indicated a qualitative shift in segmenting. For the young children (4 to 5 years), segmentation seemed to rely on phrase and syllable stress, and performance was poor. Older children responded to concrete nouns, but not to function words, as reported by Ehri (1975, 1979). The oldest children (7 years) responded fairly accurately to the abstract conception of word as the smallest, meaningful unit of language.

In learning to read children must have a minimum level of word awareness before they can realize that a systematic correspondence exists between the subunits of written and spoken words, the graphemes and phonemes. The research of Ehri (1975, 1979) and Ehri and Wilce (1985) suggests that knowledge of grapheme correspondences at the lexical level is more highly correlated with word recognition than knowledge of single grapheme-phoneme correspondences. The research of Liberman et al. (1977) indicates that it is not possible to segment a speech signal such that each segment
corresponds to one and only one phoneme. Thus children cannot be directly taught individual grapheme-phoneme correspondences, since there is not a way to represent a systematic phoneme in isolation (Gough, 1972). Children must discover the correspondences by reflecting upon spoken words and their written counterparts (Tunmer et al., 1983). Phonological awareness will be dealt with more fully in the next section.

In teaching reading it is possible to avoid segmentation problems. This is done through teaching whole words. The difficulty with this approach is that words are not learned as arbitrary units but rather within a meaning base. Children taught this way may not fully realize that the meaning of a word is separate from its phonological representation. Young children have been shown to experience difficulty in separating words from their referents (Vygotsky, 1962).

Phonological Awareness

Beginning readers easily learn to read distinct sight words. However, as new words are learned it becomes increasingly more difficult to differentiate words based on distinctive features (Gough and Hillinger, 1979). Unless the child comes to learn an alternate strategy for establishing a relationship between spoken and written language, frustration and confusion will result. In order to become a fluent reader, the child must learn to decode words.
Initially the beginning reader needs to learn that there is a systematic relationship between the letters of the alphabet and the phonemes of the language. The difficulty here is not with mastering the graphic symbols (Calfee, 1977), but rather mastering the phonological representation for the grapheme. To successfully do this, children must become phonologically aware.

Phonological awareness requires two basic realizations. First, a spoken word is an object that can be manipulated and this was discussed under word awareness. Second, words are made up of phonemes or segments. While these requirements seem straight-forward, there is ample evidence that this is not the case for young children.

The difficulty in acquiring phonological awareness has to do with the abstractness of phonemes. Many young children are not able to consciously segment words into their constituent phonemes (Calfee, 1977; Hakes, 1980; Liberman et al., 1977, 1980; Lundberg and Torneus, 1978; Rozin and Gleitman, 1977; Tunmer and Bowey, 1984; Tunmer and Nesdale, 1982). This lack of awareness of the phonemic analysis of language has been implicated in first graders' difficulties in acquiring reading skills (Calfee, 1977; Fox and Routh, 1975, 1976, 1980; Liberman et al., 1977; Lundberg, 1978; Read, 1978; Shankweiler et al., 1979; Wallach and Wallach, 1976; Wallach et al., 1977; Williams, 1984). Both Ehri (1979) and Golinkoff (1978) fully review
most of this research. While children can discriminate between speech sounds this is not the same as realizing that the relevant difference is phonemic. The realization requires conscious awareness of the relationship between orthography and phonological segments.

The crux of phonological awareness for the child is that there is no simple physical basis for recognizing phonemes in speech. The research of Liberman and her colleagues (1974, 1977) has shown that it is not possible to segment speech signals such that each segment corresponds to one and only one phoneme. As Gough states, "We cannot show him that this character goes with a systematic phoneme, for there is no way to isolate a systematic phoneme" (1972, p. 348). In decoding a word such as 'bag' the child typically segments into syllables, as in 'buh-ah-guh'. In order to "map the printed, three-letter word bag onto the spoken word bag, which is already in his lexicon, he must know that the spoken syllable also has three segments" (Liberman et al., 1977, p. 209, emphasis in original). To do this, the child must be able to phonemically segment words. Since there is not one-to-one correspondence between phonemes and graphemes, the child must learn to discover the rules for himself. This discovery largely relies on the self-monitoring of metacognitive strategies, and reasoning (Watson, 1984). In this regard, phonics is seen as a means of providing the child with information about phoneme-grapheme
relationships, but does not actually teach the skills (Gough and Hillinger, 1979).

As mentioned previously, Ehri (1979) and Golinkoff (1978) have reviewed much of the earlier research. More recent reviews have been done by Ehri (1984), Downing (1984), Watson (1984), Nesdale, Herriman and Tunmer (1984), and Blackman (1984). The main findings of the phonological awareness research, as summarized by Valtin (1984a, 1984b), are listed below, and representative studies are outlined in Table 1.

1. Phonemic segmentation is a difficult task due to the nature of the acoustic signal. In speech the phonemes are not discrete units but encoded at the acoustic level into larger units of approximately syllable size (Liberman et al., 1977). Since phonemes are abstract units, phonemic segmentation and synthesis are thus not simple associative memory tasks but highly demanding conceptual tasks (Ehri, 1984). Syllable segmentation is easier than phonemic segmentation (Fox and Routh, 1975, 1976; Gleitman and Rozin, 1973, 1977; Goldstein, 1976; Lundberg et al., 1980).

2. The difficulty of phonemic tasks varies with complexity of the operations required, e.g., recognition, counting, partial segmentation, full segmentation, manipulation, and reversal of phonemic units (Golinkoff, 1978; Lewkowicz, 1980; Nesdale, Herriman and Tunmer, 1984). The difficulty also depends on type and position of the phonemes (Lundberg, 1978).
<table>
<thead>
<tr>
<th>Authors</th>
<th>Subjects</th>
<th>Tests</th>
<th>Intensity</th>
<th>Tasks</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradley &amp; Bryant (1983)</td>
<td>Experimental: Group 1: 13 Ss</td>
<td>Pre: -Sound Categ. Test -Verbal IQ</td>
<td>40 sessions over 2 years</td>
<td>Group 1: taught sound categorization for begin, middle, &amp; final sounds using pictures Group 2: same as above &amp; used letters &amp; learned how sounds represented by letters Group 3: used pictures of Group 1 but taught to conceptualize &amp; classify them Group 4: no treatment</td>
<td>Group 1 better than Group 3 by 3 to 4 months Group 2 better than Group 1 in reading and spelling Group 2 better overall</td>
</tr>
<tr>
<td></td>
<td>Group 2: 13 Ss</td>
<td>Control: -30 trial memory</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Group 3: 26 Ss</td>
<td>Group 2: taught sound categorization for begin, middle, &amp; final sounds using pictures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Group 4: 13 Ss</td>
<td>Group 2: same as above &amp; used letters &amp; learned how sounds represented by letters</td>
<td></td>
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<tr>
<td></td>
<td>Ss matched on age, scored 2 S.D. on Sound Categorization Test, and could read no words</td>
<td>Group 3: used pictures of Group 1 but taught to conceptualize &amp; classify them</td>
<td></td>
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<tr>
<td></td>
<td>13 Ss</td>
<td>Post: -word reading Sound Categorization Test</td>
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<tr>
<td>Fox &amp; Routh (1976)</td>
<td>4-yr-olds</td>
<td>counterbalanced word tests</td>
<td>1-30 min. session</td>
<td>-reading Gibson-like forms such as words (e.g., Æ</td>
<td>ι</td>
</tr>
<tr>
<td>Goldstein (1976)</td>
<td>Group 1: 11 4-yr-olds</td>
<td>PPVT Sequential Memory Word Analysis-Synthesis Word Reading Story Test</td>
<td>12 wks-10 mins. daily</td>
<td>-Group 1: Ball-Stick-Bird sounding -Group 2: same book but learned letter names, no segmentation -results predictive of initial reading achievement -Group 1 better on reading tasks</td>
<td></td>
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<td>Group 2: 12 4-yr-olds</td>
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<tr>
<td></td>
<td>13 Ss</td>
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<tr>
<td>Marsh &amp; Mimeo (1977)</td>
<td>64 preschoolers  Group 1</td>
<td>PPVT</td>
<td>4 day trial to criterion 4 day trial to transfer to criterion</td>
<td>Group 1: pairing phoneme with grapheme Group 2: pairing phoneme to coloured card</td>
<td>-Group 1 better -significant improvement over trials</td>
</tr>
</tbody>
</table>
Table 1 (continued)

<table>
<thead>
<tr>
<th>Authors</th>
<th>Subjects</th>
<th>Tests</th>
<th>Intensity</th>
<th>Tasks</th>
<th>Results</th>
</tr>
</thead>
</table>
| Ollila, Johnson, & Downing (1974) | 60 kindergarten 3 groups | -Wepman Auditory Test  
-Phoneme Counting  
-LARR: Word matching  
Literacy Concepts  
Letter Recognition  
Beginning Sounds | 6 Weeks: 1/2 hr frequency not stated | -Elkonin tasks  
-Group 2: letter recognition & identification  
-Group 3: synthetic phonics worksheets | Elkonin approach better on Wepman & Phoneme counting  
-no LARR differences |
| Olofsson & Lundberg (1983) | Group 1: 19  
Group 2: 28  
Group 3: 14  
Group 4: 23  
Group 5: 11  
Ss: all kindergarten  
Mean age: 6.11 yrs | phonemic & synthetic word reading | 6-8 wks: 1 hr, 3-4 times/week | Group 1: structured  
Group 2: less structured  
Group 3: spontaneous  
Group 4: auditory discrimination but no sounds learned  
Group 5: Swedish preschool program | Group 1: only group to show clear gains  
Bimodal distribution of synthesis and segmentation tasks |
| Rohrlack, Bell & McLaughlin (1982) | Group 1: 9 kindergarten  
Group 2: 10 kindergarten | Lindamood Auditory Conceptualization  
Gates-McGinitie | 20 mins daily for 13 sessions | -sequencing story cards  
-sequencing sound patterns  
-blending words | Group 1 improved on Gates blending and auditory discrimination tests  
LAC parts 1A & 1B improved |
| Treiman & Baron (1983) | Group 1: 8 preschoolers  
Group 2: 20 kindergartens | | 4 days: each day was part analysis and part control | Analysis: syllables segmented into initial & phonogram (e.g., h/en)  
Control: 4 syllables read aloud with no segmentation (e.g., vok)  
Part II: read paired-associate items used in first part with analysis | Phonemic awareness helped spelling-sound rules & decoding |
<table>
<thead>
<tr>
<th>Authors</th>
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<th>Results</th>
</tr>
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<tbody>
<tr>
<td>Williams (1980)</td>
<td>60 7 to 12 yr old L.D.</td>
<td>from the program:</td>
<td>6 mos.-20 min.</td>
<td>-from the program:</td>
<td>-those taught the program better at decoding</td>
</tr>
<tr>
<td></td>
<td>Controls: 16 groups of 4 children</td>
<td>ABD's of Reading</td>
<td>daily, 3 to 4 times weekly</td>
<td>ABD's of Reading</td>
<td></td>
</tr>
</tbody>
</table>
3. Although phonemic segmentation may be trained in preschool children, not all children will learn it. The effects of phonemic training when visual aids are used to represent the sound sequence are higher (Downing, Ayers, and Schaeffer, 1978; Elkonin, 1973; Lewkowicz, 1980; Lewkowicz and Low, 1979; Lundberg, Olofsson and Wall, 1980; Marsh and Mimeo, 1977; Williams, 1980). Using letters to visualize the phonemic tasks seems to be superior to using tokens (Ehri, 1984).

4. The greatest increase in phonemic segmentation abilities can be observed between kindergarten and first graders (Calfee, Lindamood and Lindamood, 1973; Liberman et al., 1977; Lundberg, Olofsson and Wall, 1980; Rosner, 1979; Tunmer and Bowey, 1984).

5. The relationship between phonemic awareness and reading ability has been demonstrated by means of correlational studies, using concurrent or predictive or both kinds of correlations (Bruinsma, 1981; Downing, 1984; Lundberg, 1978; Leong and Haines, 1978; Mayfield, 1983; Nesdale and Tunmer, 1984).

6. The nature of this relationship remains unclear, however. There is no direct experimental evidence to specify the status of phonemic segmentation in the sense of a prerequisite, or a consequence of reading instruction. Most researchers propose an interactive
view in the sense that phonological sensitivity is both a contributor to and a consequence of learning to read (Ehri, 1979, 1984; Goldstein, 1976; Tunmer and Herriman, 1984; Wallach and Wallach, 1976; Watson, 1984).

7. The literature also gives some indication of the need for a differentiation between objectivation of language (abstraction from meaning) and phonemic awareness tasks. This was dealt with in the introduction to this section.

Golinkoff (1978) concluded, after reviewing much of the phonological awareness research:

... phonemic awareness skills ... both analysis and synthesis ... have been shown in a number of studies to be predictive of early and extended reading achievement. In fact, some studies suggest that phonemic analysis skills may be necessary for success in early reading instruction. For the child who may not have naturally acquired such skills ... the literature suggests that their reading skills may suffer ... If a child has received some type of phonemic awareness training, the literature indicates that the child's reading achievement is likely to be boosted significantly above where it would have been without training (Golinkoff, 1978, p. 38).

Strategies and Metalinguistic Awareness

The preceding review of metalinguistic awareness research indicates that both word awareness and phonological awareness are perceived as prominent in the acquisition of reading skills. Although there is little controversy over the existence of an important relationship
between reading and language, there is considerable controversy about the explanation (Watson, 1984), as suggested in the introduction to the metalinguistic review section.

The development of metalinguistic awareness is considered by some to be dependent on the development of metacognition, the controlling of intellectual processes (Tunmer and Herriman, 1984; Valtin, 1984a, 1984b). These conceptualizations often incorporate Vygotsky's (1962) view that the ability to reflect upon one's cognitive functioning (metacognition) plays an important role in the development of problem-solving abilities (Pratt and Grieve, 1984b). General metacognitive skills such as predicting, monitoring, and co-ordinating behaviors are viewed as important in developing specific 'meta' areas such as metalinguistic awareness (Brown and Deloache, 1978; Flavell, 1977, 1981). Reflective, metacognitive awareness may be enhanced when the child has cause to think about a situation. For linguistic awareness, the act of learning to read may provide insights into metacognitive skills.

The research into phonological awareness indicates that specific tasks can be taught to children. This has been shown to positively relate to reading achievement. This research, within the information-processing paradigm presented, indicates that children can be taught task relevant microstrategies for controlling task performances. Metalinguistic awareness, and general metacognitive skills
may only result when children have some experience with the problem-solving situation such as reading. The positive effect of microstrategy use on subsequent task performance has been shown in linguistic awareness research and other metacognitive areas (e.g., Brown, 1978).

That the use of microstrategies affects actual linguistic awareness in the explicit sense is, to date, unsubstantiated. Much of the reviewed literature indicated that children can be taught to perform tasks, or perceive units important in conceptualizing linguistic awareness. These measures and competencies, however, need not necessarily require consciousness or true reflection on the processes required for task completion. Thus it may be possible for a child to successfully segment phonemes, without having to reflect on the segmentation process (Lawson, 1984). So it may be that children may successfully perform task specific microstrategies, and not gain or display metalinguistic awareness in its broader sense.

This view of metalinguistic awareness, while seldomly expressly stated in research, is nonetheless discussed in conceptual reviews of the area (Tunmer and Herriman, 1984). While there is sharp rise in metalinguistic awareness after the introduction to formal reading instruction, this fact does not mean that teaching reading sooner would improve these skills. In acquiring reading skills children learn to discover how to map the printed text into existing
language, which relies on existing language ability. The child needs to be able to reflect on language to some degree in order to perform reading tasks. Thus learning to read is seen as providing a framework for learning metalinguistic skills but is not the only means of developing linguistic awareness.

If metalinguistic awareness was a consequence of learning to read then training to increase metalinguistic awareness should not affect reading achievement. While learning to read may provide the situation for developing and controlling specific metalinguistic awareness skills, without the ability to reflect upon these and use them in different situations a more explicit metalinguistic awareness may not be considered as present.

This point refers to the initial introduction and definition of linguistic awareness. In that definition, awareness was differentiated by the ability to both analyze knowledge, that is use microstrategies, and also control the use of these strategies.
CHAPTER THREE

METHOD

Purpose of the Study
The major purpose of this study was to investigate the extent to which two types of interventions, based on different strategy training approaches, had a facilitating effect on the early reading achievement as well as the simultaneous and successive information processing scores of Native Indian children. The first type of training intervention was based on the simultaneous and successive model of information processing (macrostrategies). The second type of strategy training used linguistic awareness tasks from the reading related literature (microstrategies). A third intervention combined the two types of strategy training interventions.

Hypotheses and Rationale

Hypothesis 1: Improvement in reading achievement is greater for the Strategy, Linguistic Awareness, and Combination Groups than for the Control Group.
During the intervention period all groups were exposed to regular classroom reading instruction (Ginn 720). The Experimental Groups and the Control Group received the same amount of intervention time (15 hours). However, the Control Group was not exposed to specific training, but rather games and game-like activities not believed to affect reading achievement.

The Strategy Group received training focused on simultaneous and successive processing. Reading appears to rely on both forms of processing (Kirby and Biggs, 1980). Successive processing may be utilized more during the reading acquisition stages (Aaron, 1982; Cummins and Das, 1979), where phonological and speech recoding, and decoding are usually dominant in reading programmes. With low achieving grade three Native Indian children, Krywaniuk's (1974) intervention programme, focusing on successive process training, not only improved successive processing, but also word reading. Kaufman's (1978) remediation study with average and below average grade four children also focusing on successive processing found significant post-test improvement in reading achievement. These intervention studies also relied heavily on verbal mediation and feedback during task performance. Younger children, particularly those who have been shown to have relatively weaker verbal skills (McShane and Plas, 1984), may not show the significant gains shown with older children. In spite of all this, it was felt that, based on
limited previous research, the Strategy Group would show greater improvement in reading achievement over that shown by the Control Group.

The Linguistic Awareness Group received training focused on reading related tasks. The intervention programme included teaching phoneme segmentation, syllable counting, blending, and auditory discrimination which have been shown to correlate highly with later reading achievement (Ehri, 1984; Golinkoff, 1978; Lewkowicz, 1980; Liberman et al., 1980). These skills have also been successively taught to younger non-Native children (Lundberg et al., 1980; Olofsson & Lundberg, 1983; Tunmer and Herriman, 1984). Based on this literature, it seemed appropriate to suggest that the Linguistic Awareness Group would show greater improvement in reading achievement over that shown by the Control Group.

The Combination Group received training that was a combination of both the strategy and linguistic awareness training. Strategy training and linguistic awareness training have both been shown to affect reading achievement in older and non-Native children, respectively. By receiving some training in both, the Combination Group was thus intended to address the question of any cumulative effect of the individual interventions. Compared to the Control Group, the Combination Group was expected to show greater gains in reading achievement.
Hypothesis 2: On the pre-test measure of information processing the Simultaneous Global Scale score is higher than the Sequential Global Scale score.

Little research exists on the performance of Native children regarding simultaneous and successive information processing, or their performance on the measuring instrument chosen for this study, the K-ABC. Krywaniuk's (1974) sample of low achieving grade three Native children performed significantly better than comparable white children on simultaneous tasks. Krywaniuk's measures were those used by Das, Kirby, and Jarman (1979). His sample of Native children performed poorly on the successive measures.

Kaufman and Kaufman (1983) report two reliability and validity studies on the K-ABC using Native children. Brokenleg and Bryde (1983) studied a group of Sioux children who were integrated into white society. They found no significant difference between the global scores on the Sequential Processing Scale and the Simultaneous Processing Scale. Naglieri (1983) studied a group of isolated Navajo children and found the Sequential Processing Scale to be twelve points lower than the Simultaneous Scale. In discussing the results of these two studies, Kaufman and Kaufman (1983, p. 153) suggest, "Their (Natives) strength was in visual spatial abilities; they showed less developed skill in integration of sequential
processes and reasoning." Das et al. (1979, p. 30), in addressing the differences observed in Krywaniuk's study, commented that "(P)erhaps we should understand that Native children have not learnt to use successive processes effectively."

The relatively consistent pattern of cognitive strengths and weaknesses evidenced by Native children on the WISC and WISC-R has led some to hypothesize a Native 'Learning Style' (Kaulback, 1984; More, 1984c). Various interpretations have been used to describe the pattern of test results observed. Native strengths have been shown on visual-spatial, field independent, relational, simultaneous, and performance tasks. Weaknesses have been demonstrated on auditory, field dependent, analytic, successive and verbal tasks (Krywaniuk, 1974; McShane, 1983; McShane and Plas, 1984; MacArthur, 1968a, 1968b; More, 1984c; Seyfort et al., 1980; Schubert and Cropley, 1974; More, 1984c).

Recently, More (1984b) included various learning style measures as part of a larger quality of education study of Indian students in the Okanagan Valley and the Nicola Valley of British Columbia. The K-ABC was administered to a sample of seven and ten-year-old Indian students, and a sample of ten-year-old non-Native students. For the ten-year-olds there was a significant difference between the Successive Scale performance of Natives compared to that of the non-Natives. The Simultaneous Scale scores
were not significantly different. When the K-ABC subtests were factor analyzed, two clear factors, simultaneous and successive emerged for the non-Native sample. The Native subtest scores yielded only one factor: simultaneous. Karlebach (1986) investigated these results as part of a doctoral dissertation. For the seven-year-old Natives, the Simultaneous and Successive Scale scores were not significantly different. However, when the Simultaneous and Successive Scale scores of the seven-year-olds and the ten-year-olds were analyzed, a significant increase in simultaneous performance was observed; the successive scores were not significantly different. These findings suggest a developmental trend for the emergence of simultaneous and successive processing. This trend has been suggested also in the literature, but not directly studied (Jarman, 1980; Luria, 1981; Molloy, 1973). Williams (in progress) is presently doing a doctoral dissertation on age trends in Native children using the K-ABC as the measuring instrument.

In the light of these findings, it is suggested that there would be a significant difference between performance on the Simultaneous and Sequential Processing Scales of the K-ABC for the age level being studied.
**Hypothesis 3:** On the post-test measure of information processing there is greater improvement in Successive Scale scores for the Strategy, Linguistic Awareness, and Combination Groups than for the Control Group.

For all the groups a post-test improvement in successive processing might be expected due to retesting on the same measure. A greater improvement for the Strategy and Combination Groups was hypothesized due to the intervention training on the task-appropriate use of simultaneous and successive information processing. Krywaniuk's (1974) intervention programme for low achieving grade three Native children focused on successive processing, and facilitated significant post-treatment improvement on successive and simultaneous tests for the experimental group. Kaufman's (1978) remediation study for average and below average grade four students also focused on successive processing, and also showed significant post-treatment improvement on successive and simultaneous tests for the experimental group. Brailsford's (1981) intervention programme for poor readers aged nine to twelve years focused on successive and simultaneous processing and facilitated significant post-treatment gains in tests of successive and simultaneous processing compared with a control group. These studies used older children and were
successful in improving performance on successive and simultaneous tests as used by Das, Jarman, and Kirby (1979). As these authors state "The ... intervention studies are enough to convince one that strategies can be taught" (p. 169).

An important facet in each of these studies was verbal mediation. The children were encouraged to talk about strategies they already used, to talk through new strategies being taught, and to share their reactions to doing tasks using different strategies. Thus it would seem that verbalization in older children is an effective means of de-automatizing processing. It may not be as effective with younger children for a number of reasons. Language as a means of controlling behaviour is seen to be generally established by about age seven (Luria, 1981; Tunmer et al., 1983). The children in the present study are generally younger than this, and may not be able to effectively use language as a means of de-automatizing processing, and of generalizing learned strategies to new tasks. The work of Luria (1961, 1981) and Jarman (1980) in syntagmatic-paradigmatic word association further suggests this. Syntagmatic associations are present first in language and load with successive synthesis (Jarman, 1980). Paradigmatic associations appear later, about seven years, and load simultaneously. The emergence of paradigmatic association would seem to be related to cognitive processes and the use of language as a controlling factor in behaviour. As Das, Snart, and Mulcahy (1982) state:
What is assumed here is that the path of influence of cognitive processes on reading performance may run through linguistic processes ... although there is no evidence at present which charts the path of influence (p. 105).

Indirect support for this comes from the path analysis work of Leong (1982) and Leong and Haines (1978) showing that simultaneous and successive processing have little direct effect, but rather affects linguistic awareness. "Language awareness is a mental activity which interacts on other cognitive activities on which it depends and which it can modify in turn" (Leong, 1982, p. 19).

The Linguistic Awareness Group was also hypothesized to show greater improvements on the post-test measure of successive processing than the Control Group. Successive processing has been suggested as an effective coding strategy for analytic tasks requiring phonological or speech recoding (Cummins and Das, 1977). The segmentation and blending tasks of this intervention programme were presumed to rely more heavily on successive processing. It was hypothesized that this training on reading related successive tasks would have an effect on the post-test successive processing score.
Hypothesis 4: Improvement in performance on the linguistic awareness measure, following intervention, is greater for the Linguistic Awareness Group and Combination Group than for the Strategy Group and Control Group.

A greater post-test improvement for the Linguistic Awareness and Combination Groups was hypothesized due to the perceived similarity of certain training with the measuring instrument. Both the Linguistic Awareness and Combination Groups were exposed to tasks requiring syllable counting and phoneme counting using markers. The direct exposure to test-like tasks was hypothesized to affect post-test performance on this measure.

Hypothesis 5: Improvement in performance on the language measure, following interventions, is not different for Experimental and Control Groups.

A post-test improvement for all groups was expected due to exposure to the format of the test during the pre-testing, maturation, and classroom exposure to language. The interventions and the Control Group would all be exposed to both following directions, and encouraged to verbalize during task completions. Based on these expectations it was suggested that there would be no
significant differences between the groups on the post-test measure.

Organization of the Study

The study was conducted in three stages. The first stage involved the selection of the sample of subjects from two schools, and the administration of the pre-test battery. The second stage was the teaching of the strategy training interventions. The third stage was the administration of the post-test battery, and the analysis of the data to examine the effectiveness of the interventions.

Selection of the Subjects

Permission to conduct this study was initially secured in late spring of 1984. The number of Native children to enrol in grade one would have accommodated the design of this study. However, at the commencement of this study in September, 1984, field conditions resulted in the withdrawing of permission for reasons beyond the control of the experimenter. A smaller second sample was secured, after consultation with the research committee, the study began.

This second sample consisted of Native Indian children enrolled in grade one classrooms at two different schools. Parental permission was required before a student could participate (Appendices A and B). Sixteen children, the
total grade one population at Gitsegukla School, Gitsegukla, participated. Twenty-five children, virtually all of the Native grade one population, at Lytton Elementary, Lytton, were included. Children within each school were randomly assigned to one of the four intervention groups.

After random assignment of the subjects in Lytton it was found that five were not registered Indians and their results were excluded from the study. This resulted in unequal group sizes. In Gitsegukla School there were four children in each group. Lytton had six Native children in the Strategy and Linguistic Awareness experimental groups, five Native children in the Combination experimental group, and three Native children in the Control group. Table 2 summarizes group membership within each school.

**Design**

The study was basically an Experimental/Control X Pre/Post design. The hypotheses, specifically concerned with pre- to post-test gains were addressed using a repeated measures analysis. BMDP2V (Dixon, 1983) was the computer programme used in these analyses, which included an analysis of covariance option.

The p<.05 (two-tailed test) was accepted as the probability level beyond which the hypotheses would be rejected.
Table 2: Description of Groups in Gitsegukla and Lytton

<table>
<thead>
<tr>
<th>Group</th>
<th>Location</th>
<th>N</th>
<th>Age</th>
<th># of (Non-Natives)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategy</td>
<td>Gitsegukla</td>
<td>4</td>
<td>6.4</td>
<td>.41</td>
</tr>
<tr>
<td></td>
<td>Lytton</td>
<td>6</td>
<td>6.5</td>
<td>1.24</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Linguistic Awareness</td>
<td>Gitsegukla</td>
<td>4</td>
<td>7.3</td>
<td>.97</td>
</tr>
<tr>
<td></td>
<td>Lytton</td>
<td>6</td>
<td>6.9</td>
<td>.81</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Combination</td>
<td>Gitsegukla</td>
<td>4</td>
<td>7.3</td>
<td>.96</td>
</tr>
<tr>
<td></td>
<td>Lytton</td>
<td>5</td>
<td>7.0</td>
<td>.60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Control</td>
<td>Gitsegukla</td>
<td>4</td>
<td>6.9</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td>Lytton</td>
<td>3</td>
<td>7.0</td>
<td>.70</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Pre-Test Battery

Five tests were administered as pre-test measures. All tests were administered by the experimenter. The two reading related measures, the Metropolitan Achievement Tests: Reading Instructional Tests (Farr et al., 1978), and the Braun-Neilsen Pre-Reading Inventory (Braun and Neilson, 1979), are group measures. Individually administered measures were the Kaufman Assessment Battery for Children Mental Processing Subtests (Kaufman and Kaufman, 1983), The Lindamood Auditory Conceptualization Test (Lindamood and
Lindamood, 1979), and the Token Test for Children (DiSimoni, 1978).

The Metropolitan Achievement Tests: Reading Instructional Tests (Farr et al., 1978) Primer Level, Form JI were administered to all children in grade one at both schools. The Primer level norms include Kindergarten, and normative scales for both the Fall and Spring of grade one, a range sufficient to cover the achievement levels of the sample selected. The test included subtests in Reading Comprehension, Visual Discrimination, Letter Recognition, Auditory Discrimination, Sight Vocabulary, and Phoneme/Grapheme Correspondence. Subtest reliabilities were sufficiently high, ranging from r=.85 to r=.92.

Testing was done in groups of six to seven children to ensure the accuracy of individual results. The Metropolitan Reading Instructional Tests (MAT) were administered in three thirty to forty-five minute sessions. Gitsegukla children were tested during the week of October 1, 1984, and Lytton children were tested during the week of October 29, 1984. Appendix C shows the MAT raw subtest results for the schools and groups.

The Braun-Neilsen Pre-Reading Inventory, Form A (Braun and Neilsen, 1979) was administered to all grade one children at both schools. This test consists of twelve subtests designed to measure perceptual, linguistic, and cognitive readiness for reading instruction. Performance on individual subtests is intended to be used by teachers
to indicate areas of weakness and thus areas which will require teaching. It is not intended as a predictive test of later reading achievement. Subtest reliabilities range from $r = .70$ to $r = .93$.

The Braun-Neilsen Pre-Reading Inventory was administered to groups of six or seven children. Testing was done during the week of October 1, 1984 in Gitsegukla School, and the week of October 29, 1984 in Lytton School. Pre-test raw subtest results for schools and groups are reported in Appendix D.

The Lindamood Auditory Conceptualization Test (Lindamood and Lindamood, 1979) assesses the ability to conceptualize isolated phonemes and contrasts within and between syllables in respect to identity, number, and sequence of the phonemes involved. Part I of the test deals with the ability to perceive gross and fine contrasts between phonemes heard and whether the sounds are the same or different. The child has to place blocks in a row using different coloured blocks for different sounds, and the same coloured blocks for repeated sounds. Part II deals with variations in the sequence of gross and fine discriminations. The last part of the test measures consonant-vowel contrasts with syllables, and the sequence of sounds heard. All items are a maximum of three phonemes, and teaching is allowed through practice items. The test has a possible 28 items, with a ceiling rule to reduce overtesting. Norms cover Kindergarten to Adult, and
are interpreted in terms of minimum scores needed for success in reading and spelling skill areas. The manual reports test-retest reliability using alternate forms as \( r = 0.96 \). Correlations with the Wide Range Achievement Test across grade levels are reported as \( r = 0.66 \) to \( r = 0.81 \).

The Lindamood Auditory Conceptualization Test was chosen as a measure of phonemic segmentation. It was individually administered to the children during the weeks of October 8th and 15th, 1984 in Gitsegukla, and during the weeks of October 28th and November 1st, 1984 in Lytton. Raw pre-test results are reported in Appendix E.

The Token Test for Children (DeSimoni, 1978) is a measure of both receptive and expressive language ability. The test consists of twenty tokens: ten circles and ten squares. Five circles and squares are large, and five circles and squares are small. The groups of five are coloured blue, red, yellow, green, and white. The test has five parts. Part I uses only large tokens and assesses single colour and shape knowledge. Part II uses all the tokens and asks the child to discriminate size and shape (e.g., 'Touch the large white circle.'). Part III uses only large tokens and the child has to simultaneously touch two specified tokens (e.g., 'Touch the red square and the blue circle.'). Part IV uses all the tokens and duplicates Part III. Part V uses only large tokens and requires the child to follow commands (e.g., 'Put the white circle in front of the blue square.'). There are a total of
sixty-one commands. Discontinuance rules are included. The test evidences high concurrent validity with other language measures \((r=.72)\), and has shown low correlations with chronological age \((r=.09)\). Norms cover from three to twelve years of age.

The Token Test was individually administered to the children. Testing in Gitsegukla School was done during the week of October 8, 1984, and the week of November 8, 1984 in Lytton School. Raw pre-test results for the five parts of the Token Test are reported in Appendix F.

The Kaufman Assessment Battery for Children (K-ABC) (Kaufman and Kaufman, 1983) was the measure of information processing individually administered to all children. The K-ABC measures intelligence in terms of "the individual's style of solving problems and processing information" (Kaufman and Kaufman, 1983, p. 2). Sequential processing (successive) relies on the serial or temporal order of the stimuli when solving the problem, whereas simultaneous processing relies on "gestalt-like, frequently spatial, integration of stimuli to solve the problem" (Kaufman and Kaufman, 1983, p. 2). The role of language is minimized in this test.

Sequential Processing is assessed by three subtests. Hand Movements requires performing a series of hand movements in the same order as the examiner performed them. Number Recall requires repeating a series of digits in the same order as the examiner said them. Word Order requires
touching a series of silhouettes of common objects in the same sequence as the examiner said the names of the objects (Kaufman and Kaufman, 1983, p. 3).

Simultaneous Processing is assessed by five subtests for the majority of children tested during the pre-test. Gestalt Closure requires the child to name an object or scene pictured in a partially completed 'inkblot' drawing. Triangles requires the child to assemble several identical triangles into an abstract pattern to match a model. Matrix Analogies requires the child to select a meaningful picture or abstract design which best completes a visual analogy. Spatial Memory requires the child to recall the placements of pictures on a page that was exposed briefly. Photo Series requires the child to place photographs of an event in chronological order. Reliabilities for subtests are reported in Table 3.

Kaufman and Kaufman (1983) used both principal and confirmatory factor analysis of the subtests to confirm the existence of two types of mental processing. The results of the principal factor analysis indicated "clear-cut empirical support for the existence of two and only two factors at each age level" (Kaufman and Kaufman, 1983, p. 102). Triangles and Photo Series were the strongest and most consistent measures of simultaneous processing; Word Order and Number Recall, the strongest measures of sequential processing. However, Hand Movements, which is placed on the sequential scale, showed almost equal
Table 3: Reported K-ABC Subtest and Global Scale Reliabilities

<table>
<thead>
<tr>
<th>Subtests</th>
<th>Internal 6.0-6.11 years</th>
<th>Consistency 7.0-7.11 years</th>
<th>Test-Retest (18 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Movements</td>
<td>.75</td>
<td>.75</td>
<td>.61</td>
</tr>
<tr>
<td>Gestalt Closure</td>
<td>.78</td>
<td>.62</td>
<td>.84</td>
</tr>
<tr>
<td>Number Recall</td>
<td>.83</td>
<td>.78</td>
<td>.84</td>
</tr>
<tr>
<td>Triangles</td>
<td>.88</td>
<td>.83</td>
<td>.70</td>
</tr>
<tr>
<td>Word Order</td>
<td>.87</td>
<td>.80</td>
<td>.76</td>
</tr>
<tr>
<td>Matrix Analogies</td>
<td>.81</td>
<td>.84</td>
<td>.75</td>
</tr>
<tr>
<td>Spatial Memory</td>
<td>.74</td>
<td>.81</td>
<td>.67</td>
</tr>
<tr>
<td>Photo Series</td>
<td>.82</td>
<td>.76</td>
<td>.79</td>
</tr>
<tr>
<td><strong>Global Scales:</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sequential</td>
<td>.91</td>
<td>.88</td>
<td>.82</td>
</tr>
<tr>
<td>Simultaneous</td>
<td>.93</td>
<td>.93</td>
<td>.88</td>
</tr>
<tr>
<td>Mental Processing Composite</td>
<td>.95</td>
<td>.93</td>
<td>.88</td>
</tr>
</tbody>
</table>

'Source: Kaufman and Kaufman (1983, 82-85)

loadings on both simultaneous and successive factors above the age of five years, and has shown a clear developmental trend (Kaufman and Kamphaus, 1984).

Kaufman and Kamphaus (1984) also tested a three factor solution of the Mental Processing subtests. However, various three factor solutions were rejected due to their inconsistency across age levels in the subtest loadings.

Based on the results of confirmatory factor analysis, Kaufman and Kaufman (1983) state that "The Sequential-
Simultaneous dichotomy was confirmed for all age levels" (p. 107). This reflects the construct validity of the K-ABC. Keith (1985) also found strong support for the validity of the K-ABC based on confirmatory factor analysis.

The total K-ABC Mental Processing Scales required about 45 minutes to administer. Testing was done during the weeks of October 8 and 15, 1984 in Gitsegukla School, and the weeks of October 28 and November 1, 1984 in Lytton School. Raw pre- and post-test results are summarized in Appendix G and the scaled pre-test results are given in Appendix H. Global Scale results are summarized in Appendix I.

**Intervention Phase**

The intervention programmes for the groups in Gitsegukla School commenced October 22, 1984 and concluded January 31, 1985. The programmes in Lytton School commenced November 26, 1984 and concluded March 13, 1985. All intervention programmes were taught by female teachers hired by the experimenter. Chapter IV deals with the intervention phase in detail. During these periods the children also received regular classroom reading instruction following the Ginn 720 programme.
The Post-Test Battery

The post-test battery was administered to the sixteen children at Gitsegukla School between January 29 and February 8, 1985. The post-testing at Lytton School was administered to twenty-five children and was completed between March 14 and March 26, 1985. All the tests given during the pre-test battery were re-administered in order to determine the effectiveness of the interventions. Alternate, but equivalent, forms of the Metropolitan Reading Instructional Tests (Form K1), the Braun-Neilsen Pre-Reading Inventory (Form B), and the Lindamood Auditory Conceptualization Test (Form B) were administered. The K-ABC and Token Test for Children were also re-administered. The MAT and Braun-Neilsen Pre-Reading Inventory were group administered as in the pre-testing, all other tests were individually administered. The tests were presented in the same order as in the pre-test battery. The Letter Recognition and Visual Discrimination subtests of the MAT were not administered in Lytton to reduce testing time since the Braun-Neilsen includes these subtests. Summaries of post-test results are provided in Appendices C through I.
Scoring of the Pre-Test and Post-Test Batteries

All the tests within the study were scored by the writer. The initial reading tests, the MAT and the Braun-Neilsen Pre-Reading Inventory, were scored upon completion in order to share those results with the classroom teachers. The results of the other tests were confidential.

At the completion of the data collection the individually administered tests were re-scored by a research assistant to check accuracy.
CHAPTER FOUR

THE INTERVENTION PROGRAMMES

Grouping and Scheduling for Interventions

Sixteen Native children at Gitsegukla School, Gitsegukla, were randomly assigned to one of the three Experimental Groups or to the Control Group. This was the total grade one population at this school. The children were pre-tested between October 1 and October 18, 1984. Testing could be done only in the mornings due to limitations of space within the school.

All children continued to receive reading instruction in the classroom (Ginn 720). In addition, they also received fifteen hours of intervention or control group activities. The interventions began October 22, 1984 and ended January 31, 1985, and took place on alternating mornings of the week (Mon-Wed-Fri, Tues-Thurs). Children were seen in groups of four, and each session lasted 30 minutes. The intervention instruction was done by a certified teacher who had been instructed in the use of the teaching materials. Post-testing was completed February 7, 1985.

During the initial stages of running the study, the regular classroom teacher became ill and required extended
sick leave. The school had some difficulty securing a qualified replacement teacher. In the interim, the class had a number of unqualified substitute teachers. This affected not only the academic areas, but also the behavior of the children in the classroom.

In Lytton, twenty-five children from two classrooms were included in the study. Total population of the two classrooms was thirty-one children. Children within classrooms were randomly assigned to one of the three treatment groups or to the Control group. Of the twenty-five children for whom parental permission was secured, five were non-Native. These five participated in the study, but their results were excluded from data analysis. Children from one classroom were pre-tested in the mornings between October 29 and November 9, 1984. Children from the other classroom were tested in the afternoons between the same dates.

All children continued to receive reading instruction in their classrooms. All children received an additional fifteen hours of intervention or control group activities. The interventions began November 26, 1984 and ended March 13, 1985.

The first classroom had fifteen children participating in the study. Random assignment of these children resulted in the Experimental Groups each having four children and the Control Group three children. The second classroom had ten children participating in the study. This resulted in
two Experimental Groups having three children, the other Experimental Group having two children, and the Control Groups had two children. Due to limitations of space in the mornings, and the agreement of the classroom teachers involved, the interventions were run during the afternoons. Children from the first classroom were taken during the first hour in the afternoon, and those from the second classroom during the last hour in the afternoon. Each intervention group within classrooms was instructed every other day, as in Gitsegukla School. The intervention teacher in Lytton was also a certified teacher who had been instructed in the use of the materials. The post-testing in Lytton was completed March 26, 1985.

The intervention teachers (both female) in Gitsegukla and Lytton were given an outline of the order of the tasks. They were hired by the experimenter. Each teacher was instructed as to the use of the materials. Each task was demonstrated and they practised using the actual materials. Specific directions were also included with each task. Identical materials were used. Both were requested to keep a log of activities and attendance. The experimenter visited both teachers to monitor interventions, and regularly talked to them regarding any questions they might have. A detailed description of all materials is available from the experimenter.
The Strategy Intervention

Many Native Indian children experience academic difficulty from the beginning of their schooling. More (1984b) found that one-third of Indian children in the Okanagan and Nicola Valley were a year behind actual grade placement compared with chronological grade placement by the time they entered grade two, having already repeated kindergarten/grade one. The sample in the present study was comprised of fourteen children (39%) who were repeating grade one. Children who experience academic difficulties are not believed to be deficient in the coding processes but rather inefficient in using strategies which rely on the coding processes (Das, Kirby, and Jarman, 1979). Early reading acquisition skills, particularly decoding, have been suggested as relying on successive processing (Aaron, 1982; Cummins and Das, 1977; Das, 1984c; Das, Snart, and Mulcahy, 1982; Leong and Haines, 1978; Kirby, 1982). Native children may be inadequately utilizing the processes underlying early reading skills. The intervention studies (Brailsford, 1981; Kaufman, 1978; Krywaniuk, 1974) have shown that by training in processing strategies, academic task performance can be enhanced. These studies have focused on teaching children how to use the processes. This approach thus relies on the planning unit of the brain for appropriate utilization of coding processes for a

The present study attempted to examine the effects of strategy training on coding and reading achievement. As in Krywaniuk's (1974) and Kaufman's (1978) studies, successive processing was emphasized. It was recognized that it is impossible to isolate simultaneous and successive processing, the two processes interact in coding information (Das, Kirby, and Jarman, 1979; Luria, 1966). While the strategy intervention was designed to primarily focus on successive processing, it is evident that a neat separation is not possible (Brailsford, 1981).

Verbalization during task completion was encouraged. This was done in order that strategy use could be monitored, and also to aid the children in organizing ideas. The use of verbal mediation during problem solving has been emphasized by numerous writers (Das, 1984c; Das, Snart, and Mulcahy, 1982; Kirby, 1984a, 1984b; Torgerson, 1981; Vygotsky, 1962). Vygotsky (1962, 1978) emphasized the role of verbal mediation as one strategy for problem solving, but feels it is one way of ensuring that the problem has engaged the attention. Verbal mediation is also seen as a means of involving the coding and planning levels (Das, 1984c; Vygotsky, 1978).

In the intervention studies reported, and in the present one, the aim of the programme was to promote a transfer of learned strategies to other areas, such as
reading achievement. This necessitates the involvement of the planning level mainly through the use of verbal mediation.

Verbal mediation has been an effective means for ensuring task attention and transfer of strategy use in intervention studies using older children (Brailsford, 1981; Kaufman, 1978; Krywaniuk, 1974). Younger children, particularly those characterized as having weaker verbal skills, may not be able to effectively use verbal mediation. Thus, the sample of young Native children might lack the language knowledge base to use during strategy training, in which case, training should not have the noted effect seen in older children (Torgenson, 1980). Further to this, the sample chosen may not be ready to actively organize the strategy skills being taught, particularly with the emphasized language demands.

Metacognitive research suggests that for strategy training to be effective, the basic skills necessary for the execution of the strategy must be established (Flavell, 1977; Lawson, 1980, 1984; Leong, Cheng and Das, 1983; Snow, 1982). The assumption in the intervention studies has been that coding level processes are intact, but inefficiently used. Training is thus aimed at engaging the planning level, so that coding is planned rather than automatic. For younger children, this may not be the case. Rather, the Native children may not be facile with using the processes, in particular successive coding, within an
academic setting. Nor may they know many strategies, and therefore the programme serves to teach new skills, rather than largely teaching them how to apply known skills through strategies.

Thus the failure ... to employ a given strategy ... might be due to the fact that they have only recently attained the basic skills necessary for the execution of the strategy, and these children have not had time to learn to apply them in a strategic way to aid learning (Torgenson, 1980, p. 369).

"Training that is cognitively more intrusive is often not helpful, and sometimes actually seems to be harmful" (Snow, 1982, p. 29).

The Tasks

**Task 1: PEOPLE PUZZLES** (Adapted from Kaufman, 1980)

People Puzzles (Developmental Learning Materials) consist of seven 8 1/2 X 11 inch coloured picture puzzles of people: a facial view of a toddler boy, a teen-aged boy in full view, a girl, a facial view of a boy, a man, and a grandfather, and a facial view of a woman and a grandmother. The puzzles are cut horizontally which extend the full width of the puzzle. Each puzzle picture is on a solid background of different colours, and the back of each puzzle is composed of a different green design on a white background. The upper side of each puzzle has a solid line of a different colour from the background colour, along the extreme right hand side. This task is felt to rely on successive processing.
The task was not timed, but the children were told to work as quickly as possible. The children worked individually. Each was given an envelope containing two puzzles: a baby and a boy or a girl and a grandmother. The second set of puzzles contained either a man and a woman or a grandfather and a boy.

Step 1: Each child was given an envelope with two puzzles, either a baby and a boy or a girl and a grandmother. They were instructed to put together the puzzle of the youngest as quickly as they could.

Step 2: Once they had completed the puzzle, they were directed to verbalize how the pieces were all the same. They were directed to use the front background colour as a clue or the back design.

Step 3: The children switched envelopes and redid the task, as quickly as they could. They were once again questioned about what clues they had used in choosing pieces.

Step 4: The children were given different puzzles to work with: either a man and a woman or a boy and a grandfather. Those who received the former set were instructed to put together the puzzle of the man. Those receiving the latter set were instructed to put together the youngest.

Step 5: Once they had completed the puzzle, they were asked to verbalize what clues they had used. Attention was
drawn to other possible clues they could have used, if they did not suggest them.

Step 6: The children switched envelopes and redid the puzzles as quickly as they could.

Step 7: The children were asked to summarize what they had done and how they had done it.

Task 2: ANIMAL PUZZLES (Adapted from Kaufman, 1980)

Animal Puzzles (Developmental Learning Materials) consisted of eight 8 1/2 X 11 inch coloured puzzles of common animals: cow, deer, squirrel, dog, chipmunk, horse, cat and rooster. The puzzles are cut so that the body and usually the head, legs and tail form separate pieces. Like the People Puzzles, each animal puzzle is on different green on white design. Two sets of puzzles were formed: cow, deer, squirrel and dog, or rooster, chipmunk, cat and horse. The children worked in pairs. This task is felt to be mainly successive in nature (Kaufman, 1980), although simultaneous is also evident.

Step 1: The children were told to work in pairs. They were told to work as quickly as possible. The pieces from the envelopes were dumped in front of the children, and they were instructed to assemble the puzzle of the smallest animal.

Step 2: The children were asked how they did the task, to talk about strategies for choosing the pieces. As in the People Puzzles, they were directed to look at
background colour, backside design, as well as clues they may have presented.

Step 3: The children scrambled their pieces and were told to assemble the puzzle of the biggest animal.

Step 4: Upon completion the children were once again asked what clues they had used.

Step 5: The children scrambled their pieces and changed puzzle sets between them. They were then told to assemble the pet.

Step 6: The children were encouraged to talk about how they chose the pieces.

Step 7: The children scrambled their pieces. They were directed to assemble the farm animal.

Step 8: The children were asked to summarize what they had done. They were asked to summarize how they had chosen pieces, and did using various strategies help their performance.

Task 3: MATRIX NUMBERS (Adapted from Kaufman, 1980)

This task consisted of five items. Each item was a five celled matrix which had one number per cell. Numbers were chosen so that no one number appeared more than once in any cell. Each matrix was shaped like a cross, with one central cell, and one cell on each of its sides.

Each matrix was presented on a white sheet of 8 1/2 X 11 inch paper. The matrix was placed in the centre of the paper, with each cell being one inch square. In
each case the children were shown the complete matrix, containing one digit in each cell. Thereafter, the children were shown the matrix broken down into its five component parts, but in its correct position on an otherwise empty matrix. The children were thus taken sequentially through the matrix. After viewing the entire matrix and each component separately, each child was asked to recall by writing down the numbers on a blank matrix. The response matrix had been laminated so that responses could be washed off and the matrix redone. This task focuses on successive processing.

Step 1: The children were told that they would be shown a group of numbers. Their task was to remember the numbers, and to write them from memory. They were instructed to name the numbers by saying, "First the ____, second the ____ , etc." , and shown what was meant with the first matrix. They were asked to explain what they were to do.

Step 2: They were shown the first matrix again, and shown the first page for 5 seconds. Then they were guided through the matrix and the succeeding cells of the matrix using the strategy suggested.
Step 3: They were given a blank matrix and told to write the numbers in order as they had seen on the first matrix. If they all got it correct, matrix 2 was begun. If not, they redid matrix 1 a maximum of three times.

Step 4: The other matrices were presented in the same way. The children were directed to use the same strategy each time.

Step 5: The children were asked to summarize what they had done and how they had tried to remember the numbers.

Task 4: MATRIX LETTERS (Adapted from Kaufman, 1980)

This task was similar to Matrix Numbers, and was presented in the same way. The task consisted of five items. Each item was a five celled matrix which had one letter per cell. Letters were chosen so that the top and far left letter could be grouped, and the middle and the far right letter could be grouped. Generally, the groupings were abbreviations (eg. pm). The bottom letter of each matrix was the only vowel in the matrix, and as such, could be a word, or phonetically associated with a word (eg. U - you). Each child was given up to three trials to remember the matrix. The task focuses on successive processing (Kaufman, 1980).

Step 1: The children were told that they were going to try to remember letters. They were instructed to name each letter, as they had done in Matrix Numbers, "First the
____, second the ____ , etc." The first matrix was used to show them what was meant.

**Step 2:** The children were asked to tell what they were to do.

**Step 3:** The first matrix was presented, and they were guided through the letters, saying, "First the ____ , second the ____ , etc."

**Step 4:** Each child was given a blank matrix and asked to recall the letters in the order shown on the matrix. Up to three trials were given.

**Step 5:** Matrix 2 was done in the same way.

**Step 6:** Matrix 1 was reshown to the children. Their attention was drawn to the letters to be grouped, and getting a cadence in the pronunciation. They were directed to realize that by so doing there were fewer chunks of information to recall.

**Step 7:** Matrix 2 was presented, and the children were directed to group the letters to aid recall. They were then asked to print the letters on a blank matrix. They were given up to three trials to recall the matrix.

**Step 8:** The last three matrices were presented in the same way.

**Step 9:** The children were asked to tell what they had done. Attention was drawn to the two strategies, rehearsal and grouping of letters.
Task 5: MATRIX PICTURES (Adapted from Kaufman, 1980)

This task was similar to Matrix Numbers and Letters. The task consisted of five items. Each cell had a stimulus per cell. Three of the stimuli were pictures, one stimulus was a geometric design, and the fifth stimulus was a letter. The last two stimuli were printed onto the matrix by the writer. The pictures were taken from the Ginn Word Enrichment Program Level One workbook (Clymer & Barrett, 1974). The pictures, design and letter were different for each matrix, and arranged so that neither the design nor the letter appeared more than once in any cell. The task is felt to rely on successive processing (Kaufman, 1980).

Step 1: The children were instructed that they were to recall the matrix as they had previously done. They were told to use the rehearsal strategy of saying, "First the ___, second the ___, etc."

Step 2: The children were asked to tell what they were to do.

Step 3: The children were shown the first matrix, and the cells gone through, as in the other matrices.

Step 4: They were given a blank matrix and asked to recall the matrix in order. Up to three trials were given.

Step 5: The children were again shown Matrix 1, and this time shown how the cells could be associated in order, by making up a 'story' about the cells.

Step 6: The children were shown Matrix 2, and told to try and make up their own stories to help them remember.
Step 7: They were given blank matrices and asked to recall the cells. Up to three trials were given.

Step 8: The other matrices were done following this format.

Step 9: The children were asked to summarize the task. They were directed to recall the strategies of verbal rehearsal, a recall pattern, and associating.

Task 6: PICTURE STORY ARRANGEMENT (Adapted from Kaufman, 1980)

This task consisted of five series of six pictures each (Developmental Learning Materials). Each card in the series was numbered on the back to indicate the order of placement before the child. Series were also lettered to indicate the correct sequence of the answer. The cards were placed in front of the child, and then rearranged to show a sequence of events (e.g., bedtime). Each child was given a series to arrange, and each series rotated until each child had done all five items. This task is felt to focus on successive processing (Kaufman, 1980).

Step 1: The children were told that each would be given a series of pictures which they were to put into correct order. They were told that before they started to rearrange the pictures they were to think of a title for their series. After they had said their title, then they could rearrange their pictures.
Step 2: The children were asked to tell what they were to do.

Step 3: Each child was given a series of pictures, laid down in the prescribed order. Each was asked for the title of his 'story', and then allowed to rearrange his pictures.

Step 4: The sequence of each child's story was checked, and if incorrect, s/he was allowed to redo it.

Step 5: The sets were switched, and the same steps followed.

Step 6: After all the sets had been done by the children, they were asked to tell what they had done. Various clues to help with the sequencing were discussed, such as using the clock face to help. The use of a title and a 'story' were discussed as an aid to ordering.

Task 7: SERIAL RECALL OF PICTURES (Adapted from Kaufman, 1980)

This task consisted of six items. The first two items were composed of four cards, the next two items had six cards, and the last two items had eight cards. Each 5 1/2 cm square card had a different picture of an animal or object on it. The pictures were taken from the Ginn Word Enrichment Programme Level One workbook. Each series of cards was composed of pictures which could be paired together (e.g., bat and ball) so that the first two items had two pairs, the next two items had three pairs, and the
last two items had four pairs. Picture cards were numbered on the back to indicate the order in which to place them in front of the child. The cards were arranged so that one item from each pair was in the first half of the series, while the other items from each pair were in identical order in the second half of the series (e.g., horse, bat, saddle, ball). Each child's task was to recall, in order, all the pictures in each series. The task is felt to rely on successive processing (Kaufman, 1980).

**Step 1:** The children were shown the first series of pictures. It was explained that their task was to recall all the pictures in the correct order. As the pictures were placed before them they were to say, "First the ___, second the ___, etc." Once all the pictures were down, they were to go through them again.

**Step 2:** The children were asked to tell what they were to do.

**Step 3:** The first series was placed before the children as they verbalized. Picture names were provided if they were not known.

**Step 4:** The pictures were removed, and they were asked to recall the pictures in the correct order. If they were not sure, the series was repeated.

**Step 5:** The pictures were placed before the children. This time they were directed to note that the pictures could be paired. They were told to study the pictures again, and then asked to recall them.
Step 6: They were asked to recall the order of the pictures. They were then asked to recall the different ways of remembering the pictures. They were told that they could use either way, rehearsal or pairing the items.

Step 7: The rest of the sets were done following this format.

Step 8: The children were asked to summarize what they had done, and how they had remembered the pictures.

Task 8: FREE RECALL OF PICTURES (Adapted from Kaufman, 1980)

This task consisted of seventeen items. The first six items contained four cards, the next six items had six cards, and the last five items had eight cards. Each 4 X 4 1/2 cm card had a different picture. The pictures were taken from the Ginn Word Enrichment Programme Level One workbook. In the first six items all pictures belonged to the same category (e.g., animals). In each of the other items the pictures were arranged so that a picture from each category was followed by a picture from the other category. Each card in an item was followed by a picture from the other category. Each card in an item was numbered on the back in the order in which they were to be placed in front of the child. The child's task was to recall in any order, all of the pictures. This task is felt to focus on successive processing (Kaufman, 1980).
Step 1: The children were told that they were to remember the pictures. As each picture was placed before them they were to name it.

Step 2: The children were asked to tell what they were to do.

Step 3: The first item was placed before them, and the names of pictures told to them, if they didn't know. After studying the pictures, the cards were removed.

Step 4: The children were asked to recall the pictures in any order.

Step 5: The children were shown the same item again. Attention was drawn to the fact that some of the pictures could be grouped together. They were also told that in order to remember how many pictures had been put down, to touch a finger each time a picture was named.

Step 6: The children were asked what they were to do.

Step 7: The next item was done, and up to three trials given to remember all the pictures. The remaining four card items were done.

Step 8: A six card item was placed before the children. They were directed to see that there were now two categories. They were asked to once again recall the pictures in any order, and reminded to use their fingers to help them count the pictures.

Step 9: They were asked to retell what they were to do.
Step 10: The remaining six card items were done this way.

Step 11: The eight card sets were also done following this format.

Step 12: The children were asked to summarize what they had done, and to remember the strategies they had learned for recalling things.

Task 9: SPATIAL ORIENTATION (Adapted from Kaufman, 1980)

This task is an adaptation of a filmstrip task used by Kaufman (1980). The task consisted of twenty cards designed to strengthen the ability to discriminate directional differences such as right - left, above - below in relation to a dot in space. There is a total of seventy-six questions to be responded to by the children, each involving considerable auditory attention and auditory sequential memory.

Each card consists of a vertical line or a horizontal line or both, in colours red or black. The children were asked to visualize the position of a specifically named coloured dot in relation to the lines by naming the colour of the dot. For example, the children could be asked to name the colour of the dot found above the red line and to the left of the black line. The task focuses on successive processing.
Task 10: VISUAL MATCHING OF FACES (Adapted from Kaufman, 1980)

This task consisted of twenty-two items mounted on 30 x 11 cm lime green cardboard. The task was designed to strengthen the ability to discriminate similarities and differences in faces, as well as directional aspects. It was an adaptation of a filmstrip used by Kaufman (1980). The faces were adapted from a game called Faces (Creative Toys) and consisted of black line drawings of geometrically represented faces with different eyes, noses, mouths, and eyebrows. The children's task was to indicate if the two faces mounted on the card were the same or different. The task was designed to be a small group activity with each child responding using fingers to indicate Yes the same or No different. This task focuses on successive processing.

Task 11: MAZES (Adapted from Brailsford, 1981)

This task consisted of five different mazes each mounted on brightly coloured paper and laminated so that responses could be washed off. The mazes were taken from various children's activity books, and increased slightly in difficulty. The children's task was to draw a line from the centre of the maze to the exit without crossing lines or going into 'blind' alleys. Up to three trials per maze were allowed. This task focuses on simultaneous processing (Brailsford, 1981).
Task 12: FOLLOW-THE-DOTS: NUMBERS

This task consisted of four connect-the-dots pages using numbers. The mazes used ten, thirteen, and thirty numbers. All had line clues embedded in them. The task focuses on successive processing.

Task 13: FOLLOW-THE-DOTS: LETTERS

This task consisted of three connect-the-dots pages, two using lower case letters and one using upper case letters. Each page was laminated so they could be reused. The task focuses on successive processing.

Task 14: RIDDLES

This task consisted of fourteen rhyming clues to animals. The teacher read the 'poem' and the children tried to guess the name of the animal. The task was adapted from the K-ABC Riddles subtest and is felt to focus on simultaneous processing.

Task 15: TRACKING (Adapted from Brailsford, 1981)

This task consisted of a 35 X 30 cm black and white representation of a village dissected with red lines into twenty-eight 9 X 4 cm rectangles (Le Village, Nathan). There were twenty-eight 'dominoes', each coloured appropriately for the part of the puzzle it fitted. The children's task was broken down into two parts.
The first part of the task was to gain familiarity with the puzzle parts as they fitted onto the black and white village. In this part, the 'dominoes' were all placed on the table and the children assembled the puzzle onto the larger representation. This is felt to require both successive and simultaneous processing. The children were asked what clues they used to find pieces.

The second part of the task involved auditory sequential memory and sequencing. In this part, the children were shown the village representation in black and white. They were asked to point to the part of the puzzle described in directional clues. For example, "Go up three spaces and to the left one space". They were then asked to describe what was in that particular rectangle (e.g., cows and a roof). This task is felt to focus on successive processing.

Task 16: RELATED MEMORY SETS (Adapted from Brailsford, 1981)

This task consisted of twenty-six 12 X 8.5 cm cards depicting the top or bottom of a farm animal. The bottom halves were laid on the table and the children asked to 'guess' what animal it was. To check their accuracy the top halves were then laid out, and they matched the parts. The back of each correctly assembled animal depicted a different one in black and white.
Task 17: PEGBOARD (Adapted from Krywaniuk, 1974)

This task consisted of design cards to be copied by the children using coloured pegs which were placed onto the pegboard (Developmental Learning Materials). There were five colours used in the designs. Each child was given a pegboard, and had to chose the appropriate colours and number of pegs needed to make the design on a card. The cards were from sets 1, 5, 6, 7, and 8. Set 1 taught the idea of placing the pegs. Set 5 taught forming a design like the gestalt presented, without the use of the individual peg outlines. Sets 6 and 7 each used the end and line formations which were to be followed to form the design. Set 8 used geometric shapes with the peg holes depicted as a grid; the children had to centre the design as on the card. Each child was required to complete at least ten designs, two per set. The task focuses on successive processing. As in other tasks, the children were encouraged to talk about strategies they had used for completing the designs, as well as summarizing the directions and the task.

Task 18: BLOCK DESIGNS (C.H. Stoelting Co.)

This task was devised from materials similar to those on the Wechsler Intelligence Scale for Children-Revised (Wechsler, 1974) subtest Block Design. The task consisted
of nine designs to be assembled from four blocks. The blocks were 2.5 cm square, and had the following coloured sides: red, blue, yellow, white, diagonal white and red, and diagonal blue and yellow. The children had to use the same blocks for each design. The children were told that all the blocks were identical, and had a chance to practice on an easy item. The design cards had no lines depicted on them which helped to differentiate block placement. The first three designs used colour to depict the block sides needed, the next three used diagonal lines to depict the blocks. The children were told to work as quickly as possible once the task was understood. They were asked to summarize the directions, and strategies they were using to help them complete the task. All children did the nine designs. The task is felt to focus on simultaneous processing, although successive is also present.

The Linguistic Awareness Intervention Programme

The Linguistic Awareness programme was content-specific training.

Essentially, it also facilitates simultaneous, successive, and/or organizational processes. However, in this type of training materials are used that are related to school subjects (Das, 1984c, p. 44).

The process of linguistic awareness is seen as mediating between cognitive processes and reading achievement (Leong and Haines, 1978). Linguistic awareness, the ability to focus on the form of language, has been shown to have a
strong relationship to later reading achievement (Blachman, 1984; Ehri, 1979, 1984; Golinkoff, 1978; Liberman et al., 1980; Lundberg et al., 1980; Williams, 1984).

Linguistic awareness is seen as having access to linguistic elements. In order to succeed in reading, a child needs to develop both word and phonological awareness (Downing, 1982). Included in this is the notion that sentences can be segmented into phrases, words, syllables, and phonemes, and also synthesized to create the same (Olofsson and Lundberg, 1983). Ability to both segment and synthesize phonemic elements is seen as necessary regardless of method of reading instruction (Golinkoff, 1978).

Successive processing is seen as a significant factor in beginning reading (Aaron, 1982; Das, 1984c; Das, Snart and Mulcahy, 1978). Successive processing is particularly linked with linguistic tasks which require analysis of a sequential linear structure, decoding and recoding (Cummins and Das, 1977; Das, Kirby, and Jarman, 1979; Das, Snart, and Mulcahy, 1982; Luria, 1981). Through the teaching of tasks considered content-specific, and requiring more reliance on successive processing the child learns to focus on the structural features of language, rather than the automatic use of language (Tunmer and Bowey, 1981). The use of strategies is implicated in this process, and thus the planning level.
The Tasks

Task 1: WORD CONCEPT: NOUNS AND ADJECTIVES (Adapted from Tunmer and Bowey, 1981)

This task consisted of forty items, ten items each of two nouns, three nouns, and two and three nouns, and two and three nouns and adjectives. The children each had coloured markers. Their task was to listen to what was read to them, repeat the word string, and then put down markers for the number of words said. The task required auditory memory, and is aimed at giving practice at segmenting words from what is spoken. The word strings were nongrammatical (e.g., axe, fan).

Task 2: WORD CONCEPT: VERBS AND QUANTIFIERS (Adapted from Tunmer and Bowey, 1981)

This task consisted of thirty items, ten each of two verbs and/or quantifiers, three verbs and/or quantifiers, and two and three verbs and quantifiers. The format was identical to Task 1.

Task 3: WORD CONCEPT: GRAMMATICAL STRINGS (Adapted from Tunmer and Bowey, 1981)

This task consisted of thirty items, ten each of two words forming a grammatically correct string (e.g., many
toys), three words forming a grammatically correct string (e.g., happy girls sing), and two and three word strings. It was identical in format to Task 1.

Task 4: WORD CONCEPT: SENTENCES (Adapted from Tunmer and Bowey, 1981)

This task consisted of forty items: ten each of three word sentences, four word sentences, a combination of three and four word sentences, and five word sentences. It was identical in format to Task 1.

Task 5: RHYMING:

Task 5a: Word Clues:

This task consisted of twenty items which were read to the children. Each item began, 'I am thinking of a word that rhymes with _____,' and then gives a clue to the word wanted (e.g., It is something to read). The children were required to supply the rhyming word and then say the rhyming pair of words together. The clues were taken from Reading Games and Activities (Dorsey, 1972).

Task 5b: 1, 2, 3 Cards:

This task consisted of fifteen items, each mounted on 35 X 10.5 cm lime green cardboard. On the front of each card was pasted three black and white pictures of objects, two of which rhymed. Under each picture was printed from
left to right the numbers 1, 2, or 3. The children's task was to say the names of the pictures, and then hold up fingers to indicate the number for the picture not rhyming with the others. For example, the card showed

```
cat   drum   bat
  1     2     3
```

and the children hold up two fingers to indicate the one that did not rhyme.

**Task 5c: YES - NO:**

This task consisted of twenty-three items read to the children. Each item consisted of four or five words in which either all the words rhyme, or one in the group does not. If all the words rhymed, the children were to show one finger, if they did not all rhyme, the children were to show two fingers. Items were taken from Reading Games and Activities (Dorsey, 1972).

**Task 5d: WHICH WORD DOESN'T BELONG?**

This task consisted of six items. Each item had four cards, 6 x 8 cm, on which had been pasted three pictures which rhymed and a fourth which did not rhyme with the others. Each item was on different brightly coloured paper. The items had been made self-correcting by placing a dot on the back of the card whose picture name did not rhyme with the others. The children's task was to do each item, saying the names of the pictures and identifying the one that did not rhyme.
Task 5e: WHICH WORD IS DIFFERENT?

This task consisted of twenty items which were read to the children. Each item had five words, four of which rhymed. The children had to listen to the words and then name the one that did not rhyme. Items were taken from Reading Games and Activities (Dorsey, 1972).

Task 5f: GAME – FIVE FINGERS

This game was included to reinforce the rhyming concept within a game format. Each child was given one of five cards made of 22 X 14 cm cardboard on which had been pasted five pictures in a line. This card fitted into a picket in a manilla tag folder which had been folded in half, and five 'fingers' cut across the front side. There were ten separate 10.5 X 7.5 cm cards on which had been pasted pictures that rhymed with two words on the five playing cards, but never on the same card. Each player picked up separate cards, which were placed face down on the table. The picture had to be named, and then each child checked to see if one of the pictures on their card rhymed. If one did, the child covered the picture with one of his fingers. The first child to have all have five fingers covering his pictures was the 'winner'.
Task 6: SLOW PRONUNCIATION OF WORDS

This task consisted of practising slowly pronouncing words. It had fifty-six three phoneme items, and twenty-eight four phoneme items. Each item was on an 11 X 8 cm brightly coloured paper on which different pictures had been pasted on both front and back. All items were laminated. The pictures were from the Ginn Word Enrichment Programme workbooks. Each child was required to pronounce as slowly as possible at least ten each of the three and four phoneme words.

Task 7: SYLLABLE RECOGNITION:

Task 7a: SYLLABLE MARKING (2 SYLLABLES):

This task consists of eighty-one two syllable words. The children’s task was to listen to the word read and then clap hands for the number of syllables as the word was reread. Words were from Rosner (1979). Not all words were used.

Task 7b: FIND THE HIDDEN SYLLABLE:

This task consisted of thirteen items read to the children. The children were asked to say the word and then asked if the word was in a longer word. For example, 'say ant. Is the word ant in antelope? andy?', etc. (Rosner, 1979). Not all words included were used.
Task 7c: SYLLABLE MARKING (3 - 4 SYLLABLE WORDS):

This task consisted of sixty-nine three and four syllable words. The children's task was to listen to the word read and then to clap hands as they said each syllable (Rosner, 1979). Not all words were used.

Task 7d: SYLLABLE COUNTING GAME:

This game was constructed on a green file folder playing board on which had been marked spaces. There were thirty-two 8 x 5.5 cm playing cards. On each of twenty-nine playing cards were pictures of multi-syllabic words. The remaining playing cards had directives printed on them (e.g., take another turn). The playing cards were placed face down on the table. Each child took turns turning a card over, naming the picture, and moving their marker for the number of syllables in the word. The first child to reach the 'finish' was the 'winner.' The teachers named any pictures that were not known.

Task 7e: FIND THE HIDDEN SYLLABLE II:

This task consisted of twelve items which were read to the children. It was similar to Task 7b. The children had to say a short word read to them and tell if it was embedded in a longer word. For example, 'Say two. Is the word two hidden in the word tomorrow? Say row. Is the word row hidden in the word tomorrow?' Children's responses followed a yes/no format where fingers were used for responding (Rosner, 1979).
Task 8: AUDITORY DISCRIMINATION OF INITIAL PHONEMES:

Task 8a: DOES A WORD START WITH A SPECIFIED PHONEME?

This task contained a possible twenty-eight items. The children were asked if the word read to them began with a specified phoneme. For example, 'Does the word 'money' begin with /m/?' (Rosner, 1979).

Task 8b: WHICH WORD DOESN'T BELONG?

This task consisted of eight items. Each item had four 8 X 6 cm cards on which had been pasted three pictures which began with the same phoneme and a fourth picture which did not begin with that phoneme. Each item was on a different coloured paper. The items had been made 'self-correcting' by placing dots on the back of the card that began with a different phoneme. The children's task was to do each item, saying the names of the pictures, and identifying the one that did not belong with the others. They could check their responses by turning the cards over.

Task 8c: INITIAL CONSONANT DOMINOES:

This game had thirty-nine playing cards. The cards were 10 X 5 cm; thirty-five of them had a picture at either end, and four of them had one picture and a red star at the
other end. Each child was given three cards with which to begin play. One card was put on the table with which to begin. A designated child began playing by attempting to match one of the initial phonemes on his cards to the ones on the table. If he could not match a phoneme he picked up another card and used it if it matched. If not, the next child took a turn. The red stars could be used for any phoneme. The first child to use all the cards, was the 'winner'. All picture names were told to the children, if they were unsure.

Task 8d: SAY THE MISSING SOUND:

The task consisted of one hundred and seven word pairs to be read to the children. The first word was read and then said again without the initial phoneme. The children's task was to say the initial phoneme (Rosner, 1979).

Task 9: INITIAL PHONEME SEGMENTATION: This task consisted of one hundred and two words to be read to the children. The children's task was to say the word, and then say it again deleting the initial phoneme (e.g., cat - at).
Task 10: AUDITORY DISCRIMINATION OF FINAL PHONEMES:

Task 10a: DOES A WORD END WITH A SPECIFIED PHONEME?

This task was identical to Task 8a, except that final phonemes had to be discriminated (Rosner, 1979).

Task 10b: WHICH WORD DOESN'T BELONG?

This task was identical to Task 8b, except that final phonemes had to be discriminated (Rosner, 1979).

Task 10c: SAY THE MISSING SOUND:

This task was identical to Task 8d, except that final phonemes had to be discriminated (Rosner, 1979).

Task 11: FINAL PHONEME SEGMENTATION:

This task was identical to Task 9, except that it entailed segmenting the final phoneme.

Task 12: TOTAL SEGMENTATION:

Task 12a: REVIEW SLOW PRONUNCIATION OF WORDS:

This task consisted of forty items. The items were printed pictures of two, three, and four phoneme words. The cards were 9 X 5.5 cm. As in Task 6, the children practiced naming the pictures as slowly as they could.
Task 12b: MARKERS FOR PHONEMES:

This task consisted of sixty-five items. Each item was a picture of a two, three, or four phoneme word mounted on a 6 cm yellow circle. The children had to say the name of the picture, and put down plastic markers for each phoneme heard.

Task 13: BLENDING FROM SYLLABLES:

Task 13A: COMPOUND WORDS:

This task consisted of thirty-six items, all compound words. The two words forming the compound word were read to the children and they had to tell the word (e.g., rail/road).

Task 13b: BLENDING 2 - 3 SYLLABLE WORDS:

This task consisted of thirty-two items, each a two or three syllable word. Each item was read to the children in syllables (e.g., pi/lot) and they had to identify the word.

Task 13c: BLENDING 2, 3, AND 4 SYLLABLE WORDS:

This task consisted of forty items and was further practice of Task 13b.
Task 14: BLENDING FROM PHONEMES:

This task consisted of thirty-six items. The items were picture cards of three, four, and five phoneme words. The words were read to the children in individual phonemes and they had to identify the word (e.g., b oa t).

The Combination Intervention

The Combination programme was, as the name states, a combination of both the strategy and linguistic awareness programmes. The purpose of the programme was to attempt to address the effectiveness of individual programmes versus combining the two.

The tasks used in this programme are identical to those tasks used in the individual programmes. Tasks from the strategy and linguistic awareness programmes were alternated according to the skill being taught. Tasks felt to be similar or sequentially related were done in succession to aid learning of the skill. The children did not complete all the items for a particular task, but rather did only the odd numbered items. For example, Matrix Numbers, Letters, and Pictures were done in order. The pace of this programme was faster, and less repetition of skills taught was thus provided. The tasks are listed in the order presented in the programme.

1. People Puzzles
2. Animal Puzzles
3. Word Concepts: Nouns and Verbs
4. Word Concepts: Strings and Sentences
5. Mazes
6. Riddles
7. Rhyming: a & b
8. Rhyming: c & d
9. Rhyming: e & f
10. Pegboards
11. Slow Pronunciation of Words
12. Matrix Numbers
13. Matrix Letters
14. Matrix Pictures
15. Syllables: a & c
16. Syllables: b & e
17. Follow-the-Dots: Numbers and Letters
18. Initial Phoneme Discrimination: a & b
19. Initial Phoneme Discrimination: c & d
20. Initial Phoneme Segmentation
21. Serial Recall of Pictures
22. Final Phoneme Discrimination: a & b
23. Final Phoneme Discrimination: c
24. Final Segmentation
25. Free Recall
26. Picture Story Arrangement
27. Total Segmentation
28. Spatial Orientation
29. Visual Matching
30. Blending: a & b
31. Blending: Total
32. Tracking
33. Related Memory Sets
34. Block Design

The Control Intervention

The Control Groups, while receiving no specific treatment, received equal time to that given the other groups. The main purpose of this group was to address the effect of socialization on group performance.

The activities included for this group were unstructured, once directions were understood. Some readiness tasks of skills believed to be mastered, were included.

The Tasks

Task 1: FIND THE OTHER HALF MEMORY GAME (Creative Toys):

This game consisted of fifty-four cards forming twenty-seven pairs. Each card had half of an object on it (e.g., half a train). In the first part the children had to match the halves to gain familiarity with what the pairs formed. The game was played by placing the cards face down and having a child turn two over. If the two did not match, they were turned face down, and the next child took a turn. If the two matched, then the child kept the cards
and turned two more over, until turning two which did not match. The child with the highest number of pairs was the 'winner'.

Task 2: MAKING A PUZZLE

There were two items to be done by the children. Both consisted of a black and white scrambled picture in pieces which were to be cut out and pasted onto light cardboard. The pieces were then cut out again, coloured, and put together to form a picture. Both were taken from children's activity books. The first puzzle contained pieces that were equal sized rectangles. The second puzzle had irregularly shaped pieces and was also a colour by number, with the code for the colours provided.

Task 3: ASSOCIATION GAME (Creative Toys)

This game consisted of thirty-six playing cards of sturdy cardboard. On each card were two pictures, much like a dominoe. The cards were divided equally among the players. A designated child began play by placing one of his cards in the centre of the table. The next player attached to this card another card which showed an associative connection. For example, if the centre card showed a kennel and a ball, the next player might have attached a card showing a dog or sports shoes. The child who had no cards left, or the fewest, was the 'winner'. It was necessary to name the drawings, and to let the children combine the cards before actually playing the game.
Task 4: COLOUR BY NUMBER:

This task consisted of three colour by number pictures to be completed during different sessions. The pictures were taken from various children's activity books. All involved the use of eight colours.

Task 5: WORD SEARCHES:

This task consisted of four possible word searches taken from various children's activity books. The first one was a message to be decoded using the key provided. The grid had five spaces down and five across with a total of twenty-five spaces. Each letter was identified by two numbers (e.g., 4 - 9), the first number told how far from the left hand side of the grid and the second number told how far from the top of the grid. Where the two numbers intersected the letter needed (e.g., s) was found. Word boundaries were denoted by slashes between number groupings.

The last three searches were typical word searches. Each had eight words to locate within the array of letters displayed. Each search was mounted and laminated so that responses could be wiped from the page.
Task 6: VISUAL MATCHING OF WORDS:

This task consisted of thirty sets of three, four, and five letter words to be matched. Each set has four pairs of words. The cards from one set were laid in front of the child who was match the pairs. The cards were self-correcting, that is, the same coloured dot was on the backs of identical words. This task is a variation of one commonly found in readiness books.

Task 7: REBUS BOOKS:

This was a set of ten books designed and constructed by the writer. The sentence tags in the books were from Level Two of the Ginn 720 Reading Series. Each book used a different sentence tag (e.g., "I can ride ___", "Can I ride a ___?", etc.), and pictures to complete the sentences. They were originally designed to provide repetition of the basic sight vocabulary within a meaningful base.

Task 8: WHICH WORD DOESN'T BELONG?

This task was designed and constructed by the writer using vocabulary from Level Two of the Ginn 720 Reading programme. It consisted of twenty-four job cards each containing three items. Each item had three words. The child has to decide which two words he thinks belong
together. Any response is considered correct if it can be explained. For example, the words might be 'Lad run work', and the child feels that 'work' doesn't belong with the others, since Lad can run but he can't work.

Task 9: FIVE-FINGERS GAME:

This task was identical to that in the linguistic awareness programme Task 5f. In this variation, words instead of pictures were used. The words were from Level Two of the Ginn 720 Reading programme. It was designed originally to reinforce sight vocabulary as taught in this programme.

Task 10: READ-TOGETHER BOOKS:

This is a set of eight story books from Stage One of the Story Box supplementary reading series (Ginn and Co.). The books were read to the children with some questioning of content.

Task 11: INCH CUBE DESIGNS:

This task consisted of building designs with coloured inch cubes. The designs included were the easiest, or the children allowed to build designs of their own. This was included during a number of sessions.
CHAPTER FIVE

RESULTS

The purpose of the study was to examine the efficacy of selected intervention programmes for Native Indian grade one children. The Strategy intervention was based on the simultaneous/successive model of information processing. The Linguistic Awareness intervention was based on metalinguistic tasks which have been shown to be closely related to reading achievement. The Combination intervention was a combining of both the Strategy and Linguistic Awareness interventions. The Control consisted of games and reading related activities which were felt to reflect usual classroom activities.

Five main hypotheses were generated to test the effectiveness of the interventions.

Findings Related to Hypothesis One

Hypothesis 1: Improvement in reading achievement is greater for the Strategy, Linguistic Awareness, and Combination groups than for the Control group.

A pre/post improvement on the reading measures was anticipated for all groups. However, greater improvement for the Strategy, Linguistic Awareness, and Combination groups than the Control group was hypothesized.
Principal component analysis was performed through the Alberta General Factor Analysis Program (AGFAP) (Hakstian and Kyung, 1973). The reading measure results for each subject were entered and one principal component generated for both the pre- and post-test data. The reading factor scores were thus a linear combination of the reading measures maximizing the variance of the component scores. The generated reading factor T-scores ($\bar{X}=50.0$, S.D.=$10.0$) were subsequently used in the analyses of variances.

A two by four analysis of variance was run on the pre-test reading factor scores using the BMDP2V (Dixon, 1983) programme. The two levels of school (Gitsegukla, Lytton) were crossed with the four treatment groups. This was run to determine first if school was a significant independent variable and second, the comparability of treatment groups on the pre-tests with regards to the random assignment of the subjects. Results of this analysis indicated significant group differences ($F_{3,28}=4.22$, p<.05), but nonsignificant school or interaction affect.

The school variable was deleted from subsequent analyses. A one-way ANOVA (BMDP2V) was run on the pre-test reading factor scores across the four treatment groups. Once again significant ($F_{3,28}=4.47$, p<.01) group differences on the pre-test were found. Pairwise comparisons of the group means using the Scheffé test indicated that the Combination group pre-test mean ($\bar{X}=56.9$, 139
S.D.=9.1) was significantly higher than that of the Control group (\( \bar{X}=40.3, \text{S.D.}=8.2 \), \( p<.05 \)).

The post-test reading factor scores were analyzed in a two by four analysis of variance. No significant group, school or interaction effect was found.

A one-way ANOVA was also run on post-test reading factor scores across the four treatment groups. No significant differences were found in this analysis.

Hypothesis one was directly addressed using a one-way analysis of covariance on the post-test reading factor scores by group. The covariate was the pre-test scores. With post-test reading factor scores adjusted for pre-test differences there were no significant group differences (\( F_{3,29}=.43, p>.25 \)). Thus, hypothesis one was rejected.

**Findings Related to Hypothesis Two**

**Hypothesis 2:** On the pre-test measure of information processing, the Simultaneous Global Scale score is higher than the Sequential Global Scale score.

Based on the limited research on the information processing of Native Indian children for the age levels in the study, and also using the measuring instrument chosen for this study, the K-ABC, it was suggested that there would be a significant difference between the simultaneous and successive global standard scores in favour of the simultaneous score. The mean Sequential Processing score for the sample on the pre-test was 85.7 (S.D.=12.44). The
mean Simultaneous Processing Scale score for the total sample on the pre-test was 91.6 (S.D.=10.20). A t-test for dependent samples was computed using the means for the Sequential and Simultaneous Scale scores, and was significant \( t_{35}=3.02, \ p<.05 \). The results of this test are reported in Table 9, and will be discussed in more detail with those of Hypothesis 3.

Findings Related to Hypothesis Three

Hypothesis 3: On the post-test measure of information processing there is greater improvement in Sequential Scale scores for the Strategy, Linguistic Awareness, and Combination groups than for the Control group.

For all groups a post-test improvement in sequential processing was expected due at least in part, to retesting on the same measure. But the improvement was hypothesized to be greater for the three intervention groups than for the Control groups due to treatment effects on successive information processing.

A one-way analysis of variance on the sequential processing pre-test scores was run to ensure equality of the groups with regards to random assignments of subjects. No significant differences between the groups were found. A one-way analysis of variance on post-test scores by group was used. There were no significant group differences.

More (1984b) found significant differences in the Simultaneous Processing scores of his seven- and ten-year-old Native groups. He did not find differences in
Sequential Processing scores. It must be noted that his study was in part an investigation of information processing styles of seven- and ten-year-old Native children. Although the present study found no significant improvement in Sequential Processing as a result of the interventions, the possibility of an age effect on Sequential Processing was explored. The sample consisted of four age levels ranging from five to eight years.

A four-by-two between-within analysis of variance was run with the four age levels crossed with pre- to post-testings. The results are summarized in Table 4. A significant age effect was found between the Sequential Scale scores of the five- and six- and both seven- and eight-year-old performances using a Scheffé test of the group means. The older children's performance on successive processing was weaker than that of the younger children's.

Table 4: Analysis of Variance with One Factor Repeated for Sequential Processing Scores Across the Four Age Levels

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>3941.08</td>
<td>3</td>
<td>1313.70</td>
<td>5.87**</td>
</tr>
<tr>
<td>Error</td>
<td>7163.43</td>
<td>32</td>
<td>223.86</td>
<td></td>
</tr>
<tr>
<td>Pre to Post</td>
<td>64.20</td>
<td>1</td>
<td>64.20</td>
<td>2.56</td>
</tr>
<tr>
<td>Age/Pre to Post</td>
<td>54.48</td>
<td>3</td>
<td>18.16</td>
<td>.72</td>
</tr>
<tr>
<td>Error</td>
<td>802.03</td>
<td>32</td>
<td>25.06</td>
<td></td>
</tr>
</tbody>
</table>

*p<.05 **p<.01
The membership characteristics of subjects within each age level were visually inspected. The five- and six-year-old subjects were all non-repeaters, whereas all of the older subjects were repeating grade one. In effect, the age groupings may simply have reflected differences in the information processing abilities of repeaters versus non-repeaters. Further complicating this problem was the indication of a possible sex difference on the information processing scores. This was detected while examining the descriptive statistics of the intervention groups across all measures in the study when separated by sex and repeat/non-repeat.

It was decided to explore the relationship of sex with pre and post-test performances on information processing measures across repeater versus non-repeater groups. A two by two analysis of variance design was used crossing sex with repeat versus non-repeat. Sequential, Simultaneous, and Mental Processing Composite scores at both the pre- and post-testings were analyzed, and the results are summarized in Tables 5, 6, and 7. For the Sequential Processing scores at the pre-test there was a significant difference \((F_{1,29}=15.63, p<.001)\) between repeaters and non-repeaters, but no sex or interaction effect. Analysis using the post-test scores yielded a significant difference between repeaters/non-repeaters \((F_{1,29}=13.13, p<.001)\) and a sex effect \((F_{1,29}=6.83, p<.01)\). An analysis of covariance was run on the post-test scores with the pre-test scores as the
Table 5: Summary of Analysis of Variance for Sequential Processing Scores by Sex Across Repeat/Non-repeat

<table>
<thead>
<tr>
<th>Sex</th>
<th>Repeat/Non-repeat</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>(F_{1,29}=3.53)</td>
<td>(F_{1,29}=15.63^{***})</td>
</tr>
<tr>
<td>Post</td>
<td>(F_{1,29}=6.83^{**})</td>
<td>(F_{1,29}=13.13^{***})</td>
</tr>
<tr>
<td>Post (Pre Covaried)</td>
<td>(F_{1,28}=2.86)</td>
<td>(F_{1,28}=0.59)</td>
</tr>
</tbody>
</table>

*p<.05   **p<.01   ***p<.001

Table 6: Summary of Analysis of Variance for Simultaneous Processing Scores by Sex Across Repeat/Non-repeat

<table>
<thead>
<tr>
<th>Sex</th>
<th>Repeat/Non-repeat</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>(F_{1,29}=0.25)</td>
<td>(F_{1,29}=6.84^{**})</td>
</tr>
<tr>
<td>Post</td>
<td>(F_{1,29}=0.00)</td>
<td>(F_{1,29}=8.64^{**})</td>
</tr>
<tr>
<td>Post (Pre Covaried)</td>
<td>(F_{1,28}=0.61)</td>
<td>(F_{1,28}=1.47)</td>
</tr>
</tbody>
</table>

*p<.05   **p<.01   ***p<.001

Table 7: Summary of Analysis of Variance for Mental Processing Composite Scores by Sex Across Repeat/Non-repeat

<table>
<thead>
<tr>
<th>Sex</th>
<th>Repeat/Non-repeat</th>
<th>Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre</td>
<td>(F_{1,29}=0.32)</td>
<td>(F_{1,29}=15.17^{**})</td>
</tr>
<tr>
<td>Post</td>
<td>(F_{1,29}=1.45)</td>
<td>(F_{1,29}=13.31^{***})</td>
</tr>
<tr>
<td>Post (Pre Covaried)</td>
<td>(F_{1,28}=1.77)</td>
<td>(F_{1,28}=0.29)</td>
</tr>
</tbody>
</table>

*p<.05   **p<.01   ***p<.001
covariate. There were no significant differences on any of the variables on the ANCOVA.

Identical analyses were made using the Simultaneous Processing scores (Table 6). For both the pre- and post-tests there were significant differences between the repeaters and non-repeaters ($F_{1,29}=6.82$, $p<.01$; $F_{1,29}=8.64$, $p<.01$), with no sex or interaction effects. When the post-test scores were covaried on the pre-test results, no significant results were obtained.

The Mental Processing Composite scores were also analyzed (Table 7). For both the pre- ($F_{1,29}=15.63$, $p<.001$) and the post-tests ($F_{1,29}=13.31$, $p<.001$) there were significant differences between repeaters and non-repeaters. When the post-test scores were covaried on the pre-test scores, no significant results were obtained.

These analyses indicated that sex was not related to Sequential, Simultaneous, and Mental Processing Composite scores across the repeater and non-repeater groupings. However, within the repeater and non-repeater groupings separately, this was not found to be the case. The sample was grouped by sex within repeater/non-repeater status and further analyses performed using a one-way repeated measure analysis. The results of these analyses are summarized in Table 8. As can be seen in this table, sex was a significant variable for Sequential Processing Scale scores in the total sample ($F_{1,34}=6.42$, $p<.05$;) and in those children not repeating ($F_{1,20}=5.73$, $p<.05$). Sex was not a
Table 8: Summary of Repeated Measures Analysis of Variance on Sequential, Simultaneous, and Mental Processing Composite Scores by Sex Within and Between Repeat/Non-repeat

<table>
<thead>
<tr>
<th></th>
<th>Sequential</th>
<th>Simultaneous</th>
<th>MPC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Repeaters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>$F_{1,12} = 0.13$</td>
<td>$F_{1,12} = 0.23$</td>
<td>$F_{1,12} = 0.01$</td>
</tr>
<tr>
<td>Pre/Post</td>
<td>$F_{1,12} = 0.36$</td>
<td>$F_{1,12} = 9.19^{**}$</td>
<td>$F_{1,12} = 7.14^*$</td>
</tr>
<tr>
<td><strong>Non-repeaters</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>$F_{1,20} = 5.73^*$</td>
<td>$F_{1,20} = 0.35$</td>
<td>$F_{1,20} = 2.28$</td>
</tr>
<tr>
<td>Pre/Post</td>
<td>$F_{1,20} = 4.80^*$</td>
<td>$F_{1,20} = 35.59^{***}$</td>
<td>$F_{1,20} = 29.37^{***}$</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>$F_{1,34} = 6.42^*$</td>
<td>$F_{1,34} = 0.16$</td>
<td>$F_{1,34} = 0.02$</td>
</tr>
<tr>
<td>Pre/Post</td>
<td>$F_{1,34} = 3.57$</td>
<td>$F_{1,34} = 41.12^{***}$</td>
<td>$F_{1,34} = 30.84^{***}$</td>
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<tr>
<td>Repeat/Non-repeat</td>
<td>$F_{1,34} = 17.62^{***}$</td>
<td>$F_{1,34} = 9.71^{**}$</td>
<td>$F_{1,34} = 18.58^{***}$</td>
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</tbody>
</table>

*p<.05  **p<.01  ***p<.001

significant variable in Simultaneous Processing scores nor in the Mental Processing Composite.

The results from these analyses were graphed. Figure 1 depicts the mean Sequential Processing Scale performances for the male and female repeaters and non-repeaters. For the non-repeating subjects overall, there was a significant pre- to post-test gain ($F_{1,20} = 4.80$, $p<.05$). A Scheffé test indicated that the females scored significantly higher than the males at both the pre- and post-testings. For the repeaters, neither pre- to post-test gains nor sex were significant. Overall the non-repeaters scored
Figure 1: Sequential Processing Scores by Sex Within Repeat and Non-repeat Groupings
significantly higher than the repeaters at both the pre- and post-testings. Post-testing differences across sex and repeat/non-repeat factors were nonsignificant. Figure 2 shows post-test results covaried on the pre-test.

Simultaneous Processing Scale mean scores are depicted in Figure 3. Sex was not significantly related to simultaneous information processing scores ($F_{1, 24} = .16$, $p < .25$). Non-repeating children scored significantly higher at both the pre- and post-testings. For the total sample, significance pre- to post-testing gains ($F_{1, 29} = 28.31$, $p < .001$) were made. However, as reported earlier, when post-test differences were covaried on the pre-test scores, nonsignificant results were obtained. Figure 4 shows the post-test results with the pre-test as the covariate.

Mental Processing Composite mean scores are depicted in Figure 5. No significant sex differences were found. There was a significant difference between the non-repeaters and repeaters at both pre- and post-testings, however, post-testing differences were found to be nonsignificant when the scores were covaried on pre-test results (see Figure 6).

It was decided to explore further the differential effects of sex and repeating between the Sequential and Simultaneous Processing Scales on both the pre- and post-testings. The differences between the means of the Sequential and Simultaneous Global Scales were tested for significance using a t-test for dependent samples. Both
Figure 2: Sequential Adjusted Post-test Scores by Sex Within Repeat and Non-repeat Groupings
Figure 3: Simultaneous Processing Scores by Sex Within Repeat and Non-repeat Groupings
Non-repeaters: Males •
Females ▲

Repeaters: Males o
Females Δ

Grand Mean at pre-test ■

Figure 4: Simultaneous Adjusted Post-test Scores by Sex
Within Repeat and Non-repeat Groupings
Figure 5: Mental Processing Composite Scores by Sex Within Repeat and Non-repeat Groupings
Figure 6: Mental Processing Composite Adjusted Post-test Scores by Sex Within Repeat and Non-repeat Groupings
the pre- and post-testings for male and female repeaters and non-repeaters were compared. The results of these tests are summarized in Table 9.

Once again a significant sex effect was apparent. All of the Sequential with Simultaneous Global Scale comparisons for the males were significant, regardless of repeating or not. For the females, only one of the Sequential with Simultaneous Global Scale comparisons was significant, that for the total sample at the post-testing.

Comparisons between repeaters and non-repeaters were mixed. For those children repeating, a significant difference between the Sequential and Simultaneous Global Scale scores was found for both the pre- ($t_{35}=2.5$, $p<.05$) and post-testings ($t_{35}=2.72$, $p<.05$). This reflects the gains in Simultaneous Scale scores as noted earlier and which is apparent in Figures 1 and 3. For the total sample on the pre-test, there was a significant Sequential with Simultaneous Global Scale difference, as reported in the results for Hypothesis 2. On the post-test, a significant difference was also found ($t_{35}=5.37$, $p<.05$), again reflecting greater gains on the Simultaneous than the Successive Global Scale scores.

The differential performance of repeaters and non-repeaters on the information processing measures may have interfered with the intervention group analyses. All the intervention groups had repeaters (see Table 2). Their inclusion in intervention groups analyses made group
Table 9: T-test Comparison of Sequential (SQ) with Simultaneous (SM) Global Scores at Pre- and Post-testings by Sex Within and Across Repeaters and Non-repeaters

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeaters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>SQ: 77.4</td>
<td>SQ: 77.0</td>
<td>SQ: 77.2</td>
</tr>
<tr>
<td></td>
<td>SM: 89.0</td>
<td>SM: 83.6</td>
<td>SM: 86.3</td>
</tr>
<tr>
<td></td>
<td>t=2.50*</td>
<td>t=1.16</td>
<td>t=2.53*</td>
</tr>
<tr>
<td></td>
<td>(N=7)</td>
<td>(N=7)</td>
<td>(N=14)</td>
</tr>
<tr>
<td>Post</td>
<td>SQ: 76.4</td>
<td>SQ: 80.4</td>
<td>SQ: 78.4</td>
</tr>
<tr>
<td></td>
<td>SM: 91.3</td>
<td>SM: 91.4</td>
<td>SM: 91.4</td>
</tr>
<tr>
<td></td>
<td>t=2.72*</td>
<td>t=2.03</td>
<td>t=3.46**</td>
</tr>
<tr>
<td></td>
<td>(N=7)</td>
<td>(N=7)</td>
<td>(N=14)</td>
</tr>
<tr>
<td>Non-repeaters</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>SQ: 87.0</td>
<td>SQ: 98.0</td>
<td>SQ: 91.1</td>
</tr>
<tr>
<td></td>
<td>SM: 93.8</td>
<td>SM: 97.0</td>
<td>SM: 95.0</td>
</tr>
<tr>
<td></td>
<td>t=2.40*</td>
<td>t=.32</td>
<td>t=1.76</td>
</tr>
<tr>
<td></td>
<td>(N=14)</td>
<td>(N=8)</td>
<td>(N=22)</td>
</tr>
<tr>
<td>Post</td>
<td>SQ: 90.5</td>
<td>SQ:101.1</td>
<td>SQ: 94.4</td>
</tr>
<tr>
<td></td>
<td>SM:102.9</td>
<td>SM:104.9</td>
<td>SM:103.6</td>
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<tr>
<td></td>
<td>t=4.62***</td>
<td>t=1.12</td>
<td>t=4.12***</td>
</tr>
<tr>
<td></td>
<td>(N=14)</td>
<td>(N=8)</td>
<td>(N=22)</td>
</tr>
<tr>
<td>Total</td>
<td>Pre</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SQ: 83.9</td>
<td>SQ: 88.2</td>
<td>SQ: 85.7</td>
</tr>
<tr>
<td></td>
<td>SM: 92.2</td>
<td>SM: 90.7</td>
<td>SM: 91.6</td>
</tr>
<tr>
<td></td>
<td>t=3.46**</td>
<td>t=.80</td>
<td>t=3.02**</td>
</tr>
<tr>
<td></td>
<td>(N=21)</td>
<td>(N=15)</td>
<td>(N=36)</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SQ: 85.8</td>
<td>SQ: 91.6</td>
<td>SQ: 88.1</td>
</tr>
<tr>
<td></td>
<td>SM: 99.1</td>
<td>SM: 98.6</td>
<td>SM: 98.9</td>
</tr>
<tr>
<td></td>
<td>t=5.32***</td>
<td>t=2.27*</td>
<td>t=5.37**</td>
</tr>
<tr>
<td></td>
<td>(N=21)</td>
<td>(N=15)</td>
<td>(N=36)</td>
</tr>
</tbody>
</table>

*p<.05  **p<.01  ***p<.001
effects difficult to discern, thereby obscuring intervention effects. Deletion of the repeaters would have resulted in very small numbers within the intervention group analyses. However, it was important to include repeaters in the analysis because of the large proportion of repeaters in Native Indian classes.

Findings Related to Hypothesis Four

Hypothesis 4: Improvement in performance on the linguistic awareness measure following intervention is greater for the Linguistic Awareness group and the Combination group than for the Strategy and Control groups.

Greater improvement for the Linguistic Awareness and Combination groups than the Strategy and Control groups was hypothesized due to perceived similarities of certain training tasks with the measuring instrument, the Lindamood Auditory Conceptualization Test (LAC).

A one-way analysis of variance was performed crossing the LAC raw score performance for the pre-test with the four treatment groups. Results of this analysis were nonsignificant ($F_{3,32} = .90$, $p < .25$). LAC raw score post-test results were then compared for the treatment groups. Results were nonsignificant ($F_{3,32} = 2.87$, $p = .05$). A one way analysis of variance was performed on the post-test scores covarying on the pre-test. A significant group effect was found ($F_{3,31} = 3.72$, $p < .05$). Post hoc comparisons between the adjusted group means were done using the Scheffé test. The Strategy group mean was significantly higher ($p < .05$) than the Control group mean.
The experimental groups improved from the pre- to post-testings in terms of raw score gain. The Strategy group gained nine points, the Linguistic Awareness group gained four points, and the Combination group gained five points. In sharp contrast, the Control group had identical pre- and post-test mean raw scores. Thus, the results did not support the hypothesis. Possible reasons for this are discussed in Chapter VI.

Findings Related to Hypothesis Five

Hypothesis 5: Improvement in performance on the language measure, following interventions, is not different for Experimental and Control Groups.

All groups were expected to show some improvement due to exposure to the test format. The intervention and control groups were exposed to and encouraged to verbalize during task completion. Because of this, it was felt that no significant differences would occur between the groups on the Token Test post-testing.

A one way analysis of variance was performed on the pre-test Token Test age converted scores across the four treatment groups. Results were nonsignificant ($F_{3,31}=6.82$, $p>.50$). The post-test scores were crossed with the treatment groups and the results were also nonsignificant ($F_{3,32}=.87$, $p>.25$).
Pre- to post-testing improvement was addressed using a four by two repeated measures analysis of variance. The Token Test age converted scores for the pre- and post-testings were crossed with the four treatment groups. Table 10 reports the results of this analysis. As hypothesized, group differences were nonsignificant, but pre- to post-testing improvement was significant.

Table 10: Token Test Age Score Performances From Pre to Post Testings Using a Repeated Measures Analysis of Variance

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>DF</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>163.66</td>
<td>3</td>
<td>54.55</td>
<td>.45</td>
</tr>
<tr>
<td>Error</td>
<td>3762.11</td>
<td>31</td>
<td>120.20</td>
<td></td>
</tr>
<tr>
<td>Pre to Post</td>
<td>71.90</td>
<td>1</td>
<td>71.90</td>
<td>4.17*</td>
</tr>
<tr>
<td>Group/Pre to Post</td>
<td>87.39</td>
<td>3</td>
<td>29.13</td>
<td>1.69</td>
</tr>
<tr>
<td>Error</td>
<td>533.98</td>
<td>31</td>
<td>17.23</td>
<td></td>
</tr>
</tbody>
</table>

*p<.05
CHAPTER SIX

DISCUSSION

Overall, the research on literacy seems to be ready for a better balance of the theoretical with the problem oriented, particularly for those children, young people, and adults who are having great difficulty with literacy (Chall, 1983a, p. 8).

Since the mid-1960s, there has been a burgeoning interest in the field of reading. Despite this interest in reading by various disciplines, addressing both theoretical and basic research, little of this seems to have been directed to instructional aspects. Williams (1972/73), after reviewing the literature of learning to read stated a similar sentiment:

Our focus seems to have changed in the last few years. Clearly our ultimate goal is still the improvement of reading instruction. However, what we are really working toward at present is the development of a model of reading geared more nearly to the generation of research hypotheses. In fact, we are quickly proceeding to the point where our theoretical formulations — and empirical findings — may become too refined and sophisticated to be of great use in helping to determine instructional procedures ... I do feel that we must keep at least part of our attention on the goal of how models can be applied to instructional problems (p. 123).

While researchers of basic processes in reading believe their findings should be relevant to educational practices, this does not seem to be the case. The questions addressed by basic researchers tend to be toward clarifying theoretical issues; such questions usually bear little relevance to instructional issues. Applied
research, conversely, seldom arises from theories and models of reading (Chall, 1983a). There is a "need for a shift of emphasis from the 'hardware' of reading, the relatively stable cognitive, linguistic, and perceptual factors, to the 'software', the modifiable skills and the cognitive strategies" (Willow, Borwick, and Butkowsky, 1983, p. 92).

It is within this newer conceptualization that this study was undertaken. Macrostrategies were taught which were based on the Luria/Das model of simultaneous and successive information processes and planning functions, and conceptualized as being implicated in every act of information processing including the acquisition of reading skills. The intervention programmes were intended to train the task-appropriate use of not only simultaneous and successive processes, but also of task-specific processes, with the purpose of improving the reading achievement of grade one Native Indian children. The general objective of the Strategy intervention was to teach the children to learn by emphasizing the training of cognitive strategies for tasks that focused on simultaneous and successive coding. This was attempted through encouraging the use of verbal regulation of behavior, thus trying to make the children aware of their actions. Transfer of the cognitive strategies to tasks of early reading was anticipated, though not specifically taught. The objective of the Linguistic Awareness intervention was to teach
task-specific skills (microstrategies) through practice at dealing with linguistic units. Through focusing attention on, and utilization of phonological and syntactic units of language, it was anticipated that not only linguistic awareness, but also reading achievement, would be affected. The Combination intervention was included to address the issue of cumulative effect of combined interventions over that of the individual programs.

The purpose of the study was to address the efficacy of teaching strategies to grade one Native Indian children. Children were instructed using the interventions derived largely from a theoretical perspective. While some general reservations were suggested in the literature, the viability of the specific interventions with young Native Indian children had not been attempted. The potential usefulness in this instance seemed to warrant such an undertaking.

The lack of significant group results pertaining to the research hypotheses does not negate the benefit to the experimental groups. While group effects on individual measures were not statistically significant, except in the case of the LAC, there was measureable growth from the pre- to the post-testings.

The information processing measure results at pre-testing indicated a significantly higher Simultaneous Processing Scale mean than Sequential Processing Scale ($t_{35}=3.02, p<.05$). This was anticipated, based on the
literature dealing with the cognitive functioning of Native Indian children.

It was hypothesized that the experimental groups would show greater pre- to post-testing gains on the Sequential Processing Scale than the Control group. The results of the repeated measures analysis did not support this hypothesis. Neither pre to post, nor group effects were significant. This finding supports the belief of Kirby (1984b) that macrostrategies, such as preference for a simultaneous processing style, may be difficult to change. Further support for this comes from the finding that the Simultaneous Processing Scale did show significant pre- to post-testing gains across the groups. In this regard it seems that the intervention tasks appeared to provide some practice in processing simultaneously. While the use of language was encouraged to de-automatize processing and focus attention, comments from the teachers seem to indicate that children gained facility in performing the tasks, but had difficulty explaining the steps. Indications were that the children performed the tasks using their preferred mode of processing whenever possible, in spite of presumed processing demands of the tasks. This contention supports the view of Snow (1982) and Brown and DeLoache (1978) that in order for strategy training to be effective, task performance must already be established. The novelty of the intervention tasks suggest that for many of the present sample the intervention actually served to
teach task performance rather than strategies for controlling processing.

The finding that the sample as a whole improved significantly on the Simultaneous Processing Scale suggests that this may also reflect a developmental trend. This was hypothesized from the results of a study by More (1984b) comparing seven- and ten-year-old Native Indian children's performance on the K-ABC. He found the Simultaneous Processing Scale scores to steadily increase with age, whereas the Sequential Processing Scale scores appeared to progress more slowly. In the present study, the greater gains on the Simultaneous Processing Scale affected the total K-ABC Mental Processing Composite such that the pre to post gains were also significant.

The K-ABC results were affected by age. Covarying the post-testing Sequential Processing Scale results on the pre-test resulted in no significant group or post-testing effect. In reporting these results, it was noted that the older children had all repeated, whereas the younger had not. This suggested that the age variable masked the significance of the repeating/non-repeating variable.

In analyzing the data of repeaters versus non-repeaters on Simultaneous, Sequential, and the Mental Processing Composite from pre- to post-testings this was found to be the case. Children repeating were not only significantly lower on the Sequential, Simultaneous and Mental Processing Composite performance to those children
not repeating, but also did not show pre- to post-testing gains on the Sequential Processing Scale as did non-repeaters.

The finding of a sex difference on the K-ABC Mental Processing Scales was unexpected. Sex was found to be significantly related with Sequential Processing Scale gains in non-repeaters, but not with Simultaneous Processing Scale performance, nor to the Mental Processing Composite. In investigating the relative performance of males versus females at both pre- and post-testing it was found that males were significantly stronger with simultaneous processing than successive processing, whereas the females used both processing styles equally well. The females, however, scored higher on the Sequential Processing Scale than the males, an average of five points at post-testing. The non-repeating females scored significantly higher on the Sequential Processing Scale, an average of eleven points above the non-repeating males at both pre- and post-testing.

The finding of a significant sex difference between Sequential and Simultaneous Processing Scales on the K-ABC raises the question of why this should occur. Kaufman and Kaufman (1983) noted a sex difference in preschool children, with the females scoring an average of two points higher in sequential processing. This superiority disappeared in school-aged children. The females in the present study scored an average of five points higher on
the Sequential Processing Scale than the males. The non-repeating females scored eleven points higher than the non-repeating males on the Sequential Processing Scale. The females tended to use both sequential and simultaneous processes equally well, whereas the males preferred simultaneous.

Kaufman and Kaufman (1983) found school-aged males outperformed the females on Gestalt Closure and Triangles. The females in the present sample performed about equally well on these subtests at the post-testing, but were weaker on Gestalt Closure and Triangles at the pre-testing. The superiority of the females on Number Recall and Word Order suggests they are stronger verbally than the males. This is in line with known sex differences in young children (Ansaro et al., 1981; Bannatyne, 1976; Sherman, 1978; Yarborough and Johnson, 1980).

The research into simultaneous and successive information processing of Native Indian children indicated mixed results. Kaufman and Kaufman (1983) reported two studies using the K-ABC; in one the Sioux sample evidenced no significant difference between processing styles, whereas the Navajo sample did show stronger simultaneous processing. Krywaniuk and Das (1976) found in their sample of grade three and four low-achieving Native Indian children that they performed many of the tasks by simultaneous processing. Their results were based on factor analysis of known marker tests for simultaneous and
successive processing. More (1984b) also used the K-ABC with Native Indian children, and for his sample of seven-year-olds he found no significant difference between the Global Processing Scales.

In the present sample as a whole, a significant difference between the Sequential and Simultaneous Global Scales scores was found before intervention ($t_{35}=3.02$, $p<.05$). This would agree with the reported study of Navajo children's performance (Kaufman and Kaufman, 1983), but not with More's (1984b) results. However, none of the reported studies investigated sex differences. Much of this earlier research had been directed toward validating the existence of successive and simultaneous processing in all children, and teaching strategies for efficient use of the processes. The only study to mention a sex difference was by Karlebach (1986), who found a significant sex effect in his Native Indian sample. Hand Movements, Word Order, and Photo Series were affected. His non-Native sample showed no sex effect on any of the K-ABC subtests. He interpreted this finding as a qualitative difference in how the children approached the tasks.

Within the literature on the Luria/Das model there is little to indicate a sex difference should exist, nor has this been specifically addressed. Jarman (1980) indicated that there may be a developmental trend in the development of the processes, based on syntagmatic/paradigmatic word associations. Sequential processing has been associated
with syntactic development (Kirby, 1982b), which appears earlier in children's language than semantic word associations. If one looks to language as a possible means of addressing developmental changes in sequential and simultaneous processing, then observed sex differences have more credence. This interpretation would also concur with sex differences found in the area of language and reading ability (Ansara et al., 1981; Sherman, 1978). If this is the case, as the present research has found, then it may be that both processes would be acquired, but the females would evidence earlier facility with sequential processing.

The K-ABC performances within this conceptualization could be interpreted from a different perspective. As Keith (1985), Keith and Dunbar (1984) and Das (1984b) have suggested, the Sequential Processing Scale may be more aptly named verbal memory, and the Simultaneous Processing Scale, nonverbal reasoning. The results of the present study would seem to follow more closely this interpretation. There are three main reasons for suggesting this. First, the females performed significantly higher than the males on the Sequential Processing Scale. Second, the females performed consistently higher on two of the sequential subtests having verbal content: Word Order and Number Recall. Hand Movements, the third Sequential Scale subtest, has been shown to evidence split factor loadings in seven-year-olds (Kaufman and Kaufman, 1983; Kaufman and Kamphaus, 1984),
and thus can be performed either sequentially or simultaneously. The females performed Hand Movements about equally well as the males, but this was their poorest performance on the Sequential Scale. While speculative, it may be that the females attempted Hand Movements simultaneously, resulting in lower performance. Last, the higher performance of the females than the males on the Sequential Processing Scale does not seem to be adequately accounted for within the simultaneous-successive model unless the role of language with successive processing is considered.

This line of reasoning begs the question of what the K-ABC does measure. At the onset of the present study, independent literature was not available regarding the appropriateness of the K-ABC for the purposes of the study. It would seem that the K-ABC was not an adequate measure of simultaneous and successive information processing for the age level of subjects, the competencies of the subjects, the sensitivity to processing shifts that may have occurred, and to the stability of coding processes used by the subjects. Lack of significant group differences may, in fact, reflect the posited inadequacies in the measuring instrument, rather than lack of processing changes.

Kaufman and Kaufman (1983) indicate that the K-ABC should be an effective research tool. Indications of this are based on psychometric strengths of the test and the construct validity as reported in a previous chapter. They
suggest it "be used in pretest-posttest designs to evaluate educational and psychological interventions, including long-term treatment strategies" (Kaufman and Kaufman, 1983, p. 20). They view the K-ABC Mental Processing profile as "subject to the influences of ... direct educational intervention" (ibid, p. 21). This optimism was not evidenced in the results of the present study.

The primary consideration is the adequacy of the K-ABC Mental Processing Composites to measure simultaneous and successive processing, particularly for the age levels included in the study. The authors used both principal and confirmatory factor analysis of the subtests to confirm the existence of two types of mental processing. The results of the principal factor analysis indicated "clear-cut empirical support for the existence of two and only two factors at each age level" (Kaufman and Kaufman, 1983, p. 102). They found Triangles and Photo Series to be the strongest and most consistent measures of simultaneous processing, and Work Order and Number Recall the strongest measures of sequential processing. However, Hand Movements, which is placed on the sequential scale, showed almost equal loadings on both factors above the age of five years. While Hand Movements performance is included in the Sequential Processing Scale, it may not have actually been done using successive processing, and just as likely done using simultaneous processing. Hand Movements has shown a clear developmental trend (Kaufman and Kamphaus, 1984).
Keith (1985) also factor analyzed K-ABC subtests for three age levels. At age five years he found a one factor solution, whereas ages seven and ten indicated two factors. For the younger children, Word Order and Spatial Memory loaded the highest on the unrotated first principal component. For the seven- and ten-year-olds Photo Series followed by Word Order and Triangles had the highest loadings. Rotating the factors yielded two factors but evidenced some discrepancies.

The discrepancies Keith (1985) noticed have relevance to the age levels in the present study. Hand Movements, as noted earlier, loaded on the simultaneous factor, and on both for the ten-year-olds. In the seven-year-olds Word Order had a meaningful (p>.35) loading on the simultaneous factor, whereas Photo Series loaded on both the sequential and simultaneous factors. Based on the principal factor analysis he suggests that the simultaneous factor may really reflect nonverbal reasoning and the successive factor, verbal memory. Hand Movements could be performed nonverbally, or by using verbal mediation, thus affecting its factor loadings.

Kaufman and Kaufman (1983) report results of confirmatory factor analysis, a technique designed to determine whether or not the data support the proposed organization of tasks. They state that "The Sequential-Simultaneous dichotomy was confirmed for all age groups" (ibid, p. 107), and reflects the construct validity of the K-ABC.
For the children aged five to seven years, as in this study, specific subtests may not have been performed according to the factor loadings. Hand Movements and Word Order both supposed to be sequential tasks, have been shown to also load simultaneously. Photo Series, a simultaneous task, has been shown to also load successively. Based on just the Mental Processing Composite Scores it is impossible to determine how the sample performed these tasks, and therefore if the Mental Processing Composites truly reflect Simultaneous and Sequential processing. For example, Hand Movements was performed poorly on the pretest ($\bar{X}=7.6$); does this mean that the children tried to use successive processing and through ineffective use of successive processing did poorly, or that they used simultaneous processing which is ill-suited to the task and thus did poorly? Photo Series, likewise, may have been attempted through successive processing, and poorly performed, since Kaufman and Kaufman indicated higher general loadings with the simultaneous factor. Without factor analyzing subtest results in the study this cannot be resolved conclusively.

Kaufman and Kamphaus (1984) also tested a three factor solution of the Mental Processing subtests. At ages 4, 5, 6, and 11 years a third factor emerged, and was composed of Triangles and Gestalt Closure. This dyad was felt to reflect visual perceptual skills, and these particular
subtests were the strongest in the present sample. Various three factor solutions were rejected due to their inconsistency across age levels as the subtests loadings.

Secondary consideration of the K-ABC results is given with regards to the Luria/Das model. Both simultaneous and successive processes are viewed as present at perceptual, mnestic and conceptual levels (Das, Kirby and Jarman, 1979). The K-ABC minimizes the role of language in task performance in order to make the results fairer for minority children. However, sequential processing is involved in complex behaviors of which language is one. The K-ABC has restricted the measuring of successive processing to visual and auditory shortterm memory tasks (Braken, 1985), thus severely reducing generalizability of results to complex classroom learning. Likewise, the K-ABC's simultaneous processing tasks do not generally require higher-level thinking. Triangles, Matrix Analogies, and Photo Series may require visual-spatial ability and reasoning (Kaufman & Kaufman, 1983: Bracken, 1985). In this regard the K-ABC is a measure of Block 2 functions of coding (Das, 1984d). The Block 3, planning functions, are neglected in the K-ABC. The present study was an attempt to affect coding through planning level functions; lack of significant results may realistically reflect the coding level emphasis of the test.

A third consideration of the adequacy of the K-ABC as a measuring instrument has to do with subtest specificity.
A subtest's specificity was determined by subtracting the subtest's shared variance from its reliability coefficient. Inadequate specificity was determined if the error variance exceeds specific variance (Kaufman and Kaufman, 1983, p. 188-191). At age seven years three of the eight subtests do not evidence adequate specificity: Word Order, Gestalt Closure, and Photo Series. This single age level of the others in the standardization group evidenced proportionately larger error variance, thus rendering individual interpretation of the individual subtests untenable. Interpretation of the Mental Processing Composites thus needs caution with regards to possible redundancy of individual subtests.

An important consideration of the K-ABC is lack of an adequate floor for some of the subtests. At the six year level a score of zero would earn the following scaled scores: Triangles-4, Matrix Analogies-4, and Photo Series-5. Kaufman and Kaufman (1983) note that on some subtests 10 and 20 percent of the children obtained zero credit. They specifically address the issue of careful interpretation of results where children have earned zero credit on more subtests. While most children do earn partial credit on most subtests, failure to do so can seriously and differentially alter interpretation of the Mental Processing Composites.

This point was particularly relevant for the sample in this study. On Photo Series the mean raw score at the
pre-test was 3.3, which, when converted to scaled scores, yielded a mean of 5.97. Fourteen children obtained zero credit on this subtest; 39 percent of the sample. Such performance makes interpretation extremely difficult.

A final consideration has to do with gain scores on repeated testings. For the Mental Processing Composites reported gain scores were 1 on Sequential, 6.4 on Simultaneous and 4.8 on the Mental Processing Composite (Kaufman and Kaufman, 1983, Table 4.3). Thus practice effect is greater on the simultaneous subtests. For individual subtests test-retest reliability coefficients were adequate (above .70) on all but Hand Movements (r=.61) and Spatial Memory (r=.67) and Triangles (r=.70). The greatest subtest gains were made on Gestalt Closure and Triangles, each evidencing a one point gain over an 18 day retesting. Inspection of Appendix H indicates that the total sample gained at least one point from pre- to post-testings on the majority of subtests, none were statistically significant. Based on the preceding considerations, interpretation of significant gains, had they occurred, would have been exceedingly difficult. Interventions based on the Luria/Das model, and as reported, have generally relied on the use of factor analysis for determining shifts in processing. In studies where this was not done (Brailsford, 1981), pre- to post-performance was studied on known simultaneous and successive marker tests, such as the Raven's Progressive
Matrices and Serial Recall of Words, respectively. The tests, in some instances, have borne close relationships to teaching tasks, and would thus be expected to show improvement, but not necessarily to shift from successive to simultaneous processing or visa-versa (Krywaniuk and Das, 1976).

In the present study this was not the case. The tasks were largely adapted from the work of Das and his colleagues. The testing tasks were not directly comparable to the teaching tasks, except that simultaneous and successive coding were required in both. The emphasis in the interventions, as previously cited, was at planning level functions, which the K-ABC does not seem to address or measure adequately. In addressing the adequacy of the K-ABC as the measuring instrument in the study, it seems in retrospect, to have been inadequate for the age level of the subjects, the competencies of the subjects, the sensitivity to processing shifts which may have occurred, and to the stability of coding processes used by the subjects on individual subtests. Even assuming the test did measure simultaneous and sequential processing, given the coding level emphasis of the test it is debatable whether the K-ABC would have been sensitive to the planning level emphasis in the strategy intervention (Das, 1984d; Sternberg, 1984).

Further support for this contention was observed on the Lindamood Auditory Conceptualization Test (LAC)
results. The Strategy group showed significant gains when compared with the Control group. This finding was not anticipated, and suggested that the LAC may actually be a planning level task. Interpreted from both the Luria/Das model and the linguistic awareness research, the significant relationship of LAC performance to later reading achievement may be explained with reference to the control aspect of cognition. Thus the interventions appeared to have affected both awareness and control of a strategy for task performance. That the strategy did not transfer to reading related tasks indicated what Flavell (1978; 1985) and Lawson (1984) refer to as domain specific metacognitive knowledge. The LAC may actually serve as a measure of cognitive control within a linguistic awareness framework, accounting for its strong relationship with later reading achievement. The finding that all of the intervention groups evidenced gains on the LAC, except the Control group, is support for the notion of teachability of macrostrategies and microstrategies, and is seen as directly related to the interventions. The teaching of both macro and microstrategies may be necessary to ensure transfer to reading tasks (Snow, 1982).

Das, Kirby and Jarman (1979) and Jarman (1980) found that cross modal matching loaded with both simultaneous and successive processing. On the pre-testing the children attempted to use their preferred mode of information processing; the task would be performed automatically
without conscious awareness of it. The Strategy group, through the intervention, learned to be aware and to control some ways of processing information processing, and seem to have done so on this particular measure. This would suggest that the intervention was successful at affecting their use of a macrostrategy.

The use of the macrostrategy did not transfer to the reading tasks. The Strategy group, while being aware of the strategy for general task performance, did not have the concepts for generalizing the learned skills to reading. The tasks was not viewed as related to reading, and therefore as not linguistic in nature. They had conscious awareness of the strategy, but lacked the knowledge of the concepts in written language with which to generalize (Ryan and Ledger, 1984; Valtin, 1984a; 1984b).

This is an important theoretical point. The strategy for children in performing the LAC, showed improvement in awareness and control of a macrostrategy for task performance. They did not seem to learn essential concepts needed to utilize the strategy in reading. This point supports the notion that metacognitive knowledge should be considered as distinct from the control of processes. Metacognitive knowledge is learned as domain specific (Flavell, 1985; Lawson, 1984). Thus the Strategy group improved their control of a general macrostrategy, but this does not seem to have been solely the result of using linguistic tasks, and therefore did not improve other metalinguistic task performances.
Successful performance on the LAC has been used to indicate the presence of metalinguistic awareness and knowledge needed in phonemic segmentation. However, the finding that particularly the Strategy group could be taught a macrostrategy for improving their LAC performance, and not generalize this to other reading tasks, suggests that the LAC may be a measure of planning level functions or control functions which are usually tested within metalinguistic domains. The LAC has been used within the reading literature to assess phonemic segmentation ability, and address its relationship to later reading achievement. As Leong and Haines (1978) found, the LAC was the most predictive measure of various segmentation tasks they used. The reason for this may not be because of its assessment of only metalinguistic knowledge, but because it is also assessing the presence of the control processes necessary to perform the tasks. Thus the LAC may actually be assessing the ability to cognitively control and reason in a way though necessary in acquiring reading skills, but not necessarily restricted to just this area.

The ability to consciously control behavior without domain specific knowledge does not necessarily lead to better domain specific performance. It may be that successful performance on the LAC does not reduce 'cognitive confusion' in reading (Downing, 1984). In order to acquire reading skill children need to learn domain
specific concepts such as 'word', 'sentence', etc., and this has been shown to relate to readiness in reading (Bruinsma, 1981; Downing, Ayers, and Schaeffer, 1975). Once these are acquired, then strategies can be learned for specifically relating control of processing to task performance. Without the domain specific concepts, the control or planning level functions do not spontaneously generalize to the micro level, at least not in young children (Kirby, 1984b).

The Strategy group did show significant improvement on the LAC. However, their relative performance to the standards set on the LAC must be considered. In this regard, their performance was below that considered necessary for success in grade one reading. Their actual performance was comparable to that of kindergarten children, and as such was relatively weak.

The lack of measureable gain by the Control group was quite remarkable. In light of this, the gains made by the other groups may be considered a direct result of the interventions, rather than of classroom teaching.

LAC performance was sensitive to both macro and microstrategy interventions. This again suggests the test may be measuring more than phonemic segmentation or auditory conceptualization. If this were strictly the case, the Linguistic Awareness group, which had task specific training, should have shown the greatest gains. In order for the LAC to be predictive of reading
achievement, teaching both domain specific microstrategies as well as macrostrategies may be necessary. Teaching one without the other, while affecting LAC performance, does not seem to readily affect other reading achievement measures.

The results of the study indicated that the interventions were successful in producing improvement on a number of measures. However, the interventions did not differentially affect the measures. Within the conceptual analysis, the children seemed to gain actual awareness or metacognitive knowledge about their thinking skills. They learned to focus on specific language forms and to control their behavior during task performance. For these children the interventions seem to have functioned as a learning situation, rather than strictly learning to control already existing processing. In this instance, the skills did not appear to generalize due to inexperience dealing with the problem-solving situations (Brown and DeLoache, 1978). Further to this point is the role of language as a means of regulating behavior and of generalizing to different situations. The macrostrategy intervention attempted to include verbal mediation, but in actual task performance there was no guarantee that the children did de-automatize thought processes. Likewise, the microstrategy intervention through its use of language attempted to de-automatize language from its meaning. The novelty of this approach may have served to make the children aware of
this function and to teach some skills, but not to the point where mastery of specific language units was assured nor metalinguistic awareness fully gained. The interventions would appear to have functioned at the planning level in the role of formulating strategies, rather than of controlling existing strategies.

Limitations of the Study

A major limitation in the study was the variability among the Native subjects. The high proportion of repeaters, as found in Native classes, coupled with the small sample size made group effects difficult to determine.

A second major limitation in the study was the measure chosen to assess information processing. The recent literature regarding the K-ABC (Bracken, 1985; Das, 1984d; Keith, 1985; Keith and Dunbar, 1985) made conclusions concerning information processing preferences, stability and changes in proficiency for the age levels included, impossible to make within the design of the study. The effectiveness of the interventions could not therefore be adequately determined.

Recommendations for Future Research

The results of the study raise a number of issues regarding variability among Native Indian subjects at this age level. The differential performance of repeaters
versus the non-repeaters, particularly on the K-ABC, indicates this to be an important consideration in designing such studies.

Another issue is the sex effect on the K-ABC Mental Processing subtests which needs to be replicated across various age levels. In light of this, the construct validity of this test for British Columbia Native Indian Children requires further study.

It is not possible to make specific recommendations regarding the comparative effectiveness of the interventions on reading achievement. However, the positive comments from the teachers involved suggests that further interventions are worthwhile. Future research endeavours might investigate the length of the treatment period as well as the possibility of intervention effects on achievement during the subsequent school year. It may be that effects are not apparent immediately but rather are incorporated over time and across various academic tasks. Teacher comments further suggest that it is difficult to ensure verbalization when instructing small groups of children at this age level. Future research should consider reducing the group size in order to increase verbalization and in turn the efficacy of the interventions.

Another avenue to address in future research is competency levels of the subjects before either strategy or linguistic awareness training is effective. The language
proficiency in this sample of children was comparatively low, and it may be that a certain amount of language functioning is needed before training is beneficial. In this regard, training aimed at developing language functioning may be a prerequisite to any training program.
REFERENCES


APPENDIX A

GITSEGUKLA PARENTAL CONSENT LETTER
SEPTEMBER 24th, 1984

Dear Parents:

A project is being done in your child's school. The project is looking at ways to improve Grade one reading achievement. Children in the project will be taught ways of thinking which should help them to read better.

The project includes testing and teaching children. At the beginning each child will be given a number of tests dealing with reading and ways of thinking. The children will then be taught the program of different ways to think. This will average 1 1/4 hrs. a week for about 12 weeks. Then each child will again be tested in reading and ways of thinking. All testing will be known only to us, and not told to anyone else.

The project has been explained to the leader of School District #88 and the Kitsegukla School Board. They agree that teaching of these skills should help the children involved learn to read better. Therefore, we are asking your permission to include your child in the program. You may stop your child's involvement in the project at anytime, if you wish.

Would you please complete the attached Parent Consent Form and return it to your child's school as soon as possible.

If you have any questions, please do not hesitate to contact us at your child's school.

Thank-you very much.

PATRICK CHURCH
Principal
APPENDIX B

LYTTON PARENTAL CONSENT LETTER
Dear Parents:

A project is being done in your child's school. The project is looking at ways to improve Grade one reading achievement. Children in the project will be taught ways of thinking which should help them to read better.

The project includes testing and teaching children. At the beginning each child will be given a number of tests dealing with reading and ways of thinking. The children will then be taught the program of different ways to think. This will average 1 1/4 hrs. a week for about 12 weeks. Then each child will again be tested in reading and ways of thinking. All testing will be known only to us, and not told to anyone else.

The project has been explained to the leader of School District #30 and the Lytton School Board. They agree that teaching of these skills should help the children involved learn to read better. Therefore, we are asking your permission to include your child in the program. You may stop your child's involvement in the project at anytime, if you wish.

Would you please complete the attached Parent Consent Form and return it to your child's school as soon as possible.

If you have any questions, please do not hesitate to contact us at your child's school.

Thank-you very much.

D. Elmore,
Principal
APPENDIX C

MAT SUBTEST RESULTS
### Appendix C

**MAT Raw Pre- and Post-Test Results for Schools and Groups**

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APPENDIX D

BRAUN-NEILSEN RESULTS
## Appendix D

**Braun-Neilsen Raw Pre- and Post-Test Results for Schools and Groups**

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APPENDIX E

LINDAMOOD AUDITORY CONCEPTUALIZATION RESULTS
Appendix E

Lindamood Auditory Conceptualization Raw Pre- and Post-Test Results for Schools and Groups

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APPENDIX F

TOKEN TEST RESULTS
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APPENDIX G

K-ABC RAW PRE- AND POST-TEST RESULTS
## Appendix G

**K-ABC Raw Pre- and Post-Test Results**

for Schools and Groups

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APPENDIX H

K-ABC SCALED PRE- AND POST-TEST RESULTS
## Appendix H

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APPENDIX I

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Appendix I
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for Schools and Groups

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