A COMPARISON OF THE RECATEGORIZED WISC-R SCORES OF GOOD AND POOR SPELLERS

by

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ABSTRACT

The WISC-R (Wechsler, 1974) was administered to 29 good spellers and 31 poor spellers in grade six. The obtained scaled scores were recategorized in the manner suggested by Bannatyne (1974) into Spatial (Block Design, Object Assembly, and Picture Completion), Conceptual (Vocabulary, Similarities, and Comprehension), and Sequential (Digit Span, Coding, and Arithmetic) categories. The poor spellers were highest (mean score) in the Spatial category, intermediate in the Conceptual category, and lowest in the Sequential category. The good spellers were highest in the Conceptual category, intermediate in the Sequential category and lowest in the Spatial category.

These results are similar to those obtained in Bannatyne's 1971 study of genetic dyslexic children, and other studies reported in the literature for disabled and retarded readers. The implications of these findings are briefly discussed.

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CHAPTER I

INTRODUCTION

Spelling is the correct sequencing of letters from the alphabet to form words. Spelling is basic to and an important element for effective written communication and verbal learning.

> Spelling is a sort of draft horse of written expression. The idea to be expressed may be impelling, the language expression of the best, but without the vehicle of spelling, the load of work in writing cannot be easily done.
>
> (Hildreth, 1955)

The ability to spell well is neither the least important nor the most important aspect of the writing task, but it is an essential aspect of the written expression. Hildreth (1955) has presented three cogent arguments for teaching children to spell.

1. Ability to spell enables the writer to concentrate on the ideas he wishes to convey rather than on the mechanics of writing.

2. Ability to spell is often regarded as evidence of scholarly achievement. Justifiably or not, incorrect spelling often creates an unfavourable impression beyond its true significance.

3. Correct spelling facilitates the reading of what is written. It is common courtesy the reader has a right to expect.

Thus it is rather important for each of us to spell every word correctly in all written communication.

> Accurate spelling is so generally associated with literacy that the results school children achieve in spelling have been known to influence public attitudes toward the schools.
>
> (Hanna, 1971)

Some children experience difficulties in learning to read and spell despite an adequate intellectual and emotional environment. Instead of blaming the poor spellers, one should encourage them by pro-

viding them with the means to improve their skills. The cause of poor spelling is often assumed to be lack of desire to learn. The best motivation for improvement is success and one must learn how to give poor spellers some success in spelling.

The act of spelling involves going from sounds to letters, a matter of encoding. In spelling, the child hears a sound or group of sounds that he himself either utters or thinks. He must decide which letter or groups of letters will suitably convey that sound or group of sounds to someone else reading what he has written. One can spell orally without writing, but the function of spelling is effective and accurate communication in writing. One cannot truly write without spelling because the purpose of writing is to record words in meaningful relationships.

It is frequently observed that intelligence is not as important a factor in spelling as it is in reading. Some bright children are poor spellers, and some dull children spell much more accurately than the average of their achievement in other subjects would indicate.

> Spelling requires more auditory and visual discrimination, memory, sequentialization, analysis and synthesis, and integration simultaneously than perhaps any other skill. Thus it is evident that the majority of children with learning disabilities have deficits in spelling.
>
> (Johnson & Myklebust, 1967)

Background to the Problem

> Spelling, as a written test, and perhaps as an oral test (because of the importance of sound blending) is very much (but not entirely) determined by the efficiency of the motor/kinesthetic/praxic/visuo-spatial output, or encoding processes, the sequential memory influence in these processes, and the degree of automatization or habituation which has or has not been achieved in that output.
>
> It is reasonable to suggest that children who find blending difficult in reading, or letter reproduction and sequencing difficult in spelling, have a less efficient encoding vocal-motor programming of articulemes than do their peers.
>
> (Bannatyne, 1969)

Bannatyne (1968, 1971) has suggested that the WISC subtest scores of genetic dyslexic readers are best analyzed in terms of categories he calls Spatial, Conceptual, and Sequential. This is a departure from the usual practice of analyzing WISC Verbal Scale-Performance Scale differences. According to Bannatyne, subtests in the Spatial category (Block Design, Object Assembly, and Picture Completion) require the ability to manipulate objects directly or symbolically in multi-dimensional space. Subtests in the Conceptual category (Vocabulary, Similarities, and Comprehension) require abilities more closely related to language functioning. Subtests in the Sequential category (Digit Span, Coding, and Arithmetic) require the ability to retain sequences of auditory and visual stimuli in short term memory storage. Bannatyne also reported that the genetic dyslexic children received their highest scores in the Spatial category, intermediate scores in the Conceptual category, and their lowest scores in the Sequential category.

Naidoo (1972) specifically noted that the early language difficulties reported in her series of learning disabled children occurred predominantly in the reading plus spelling retardates as compared to the spelling only retardates. Thus there was an abnormally high incidence of Verbal-Performance IQ discrepancies in the children who have specific reading and spelling retardation rather than those who are only spelling retardates. However, children who are poor in spelling scored lower in the Digit Span, Arithmetic, Coding, and Picture Arrangement subtests of the WISC, which explains some learning disabilities in terms of an underlying difficulty in dealing with the sequential aspects of materials.

Nelson and Warrington (1974) compared two groups of children who were (1) spelling-only retardates, and (2) spelling and reading retardates on individual WISC subtest scores. The spelling-only group scored highest

on Block Design, followed by Similarities and then the Vocabulary subtests, while the spelling and reading group scored highest on Picture Completion, followed by Block Design and then Similarities subtest.

In 1977, Smith, Coleman, Dokecki and Davis concluded a study which assessed the utility of Bannatyne's recategorization of subtest scaled scores on the WISC-R. The WISC-R was administered to 208 school-verified learning disabled (LD) children. The obtained subtest scaled scores were recategorized in the manner suggested by Bannatyne (1974) into Spatial, Conceptual, and Sequential categories. The mean Spatial score was significantly greater than the mean Conceptual score, which, in turn, exceeded the Sequential score. The total sample was also subdivided into high and low IQ subgroups to determine if the Spatial, Conceptual and Sequential pattern was affected by or independent of the level of intellectual functioning. High and low IQ subgroups exhibitied similar patterns of recategorized scores.

Bannatyne (1974) in further consideration of the generalizability of this pattern of abilities as reflected on a WISC profile suggests,

> This strength in the visuo-spatial area is characteristic of a large proportion of disabled readers. This suggests that there may be a subclass of disabled readers who are not necessarily genetic dyslexic, but who possess the same pattern of good visuo-spatial and poor (auditory sequential) memory abilities.

Given the basic assumptions of Bannatyne suggested by his research and the expanded concept of this idea to a larger group of disabled learners, this researcher decided to identify the following problem for investigation.

Statement of the Problem

The purpose of the present study was to compare the recategorized WISC-R scores of good and poor spellers, involving a Spatial score (Block

Design, Object Assembly, and Picture Completion), a Conceptual score (Vocabulary, Similarities, and Comprehension), and a Sequential score (Digit Span, Coding, and Arithmetic) as suggested by Bannatyne (1974).

Definitions

Conceptual. To group mentally, or picture essential elements of a specific situation. (The abstraction may then be applied to another situation).

Genetic Dyslexic. The term used to describe those persons (almost always male), who exhibit a syndrome of specific linguistic skill disabilities which restrict their ability to learn to read, spell and write as well as their full scale intelligence would indicate. There is a body of research evidence which indicates that the condition is inherited. (Bannatyne, 1968)

Learning Disability. Learning disability refers to a retardation, disorder, or delayed development in one or more of the processes of speech, language, reading, writing, arithmetic, or other school subjects resulting from a psychological handicap caused by a possible cerebral dysfunction and/or emotional and/or behavioural disturbance. It is not the result of mental retardation, sensory deprivation, or cultural or instructional factors. (Kirk, 1962)

Poor Spellers. It is used particularly in this study for those students who scored 60% or less in the specially prepared spelling test.

Sequencing Ability. Sequencing Ability is a time oriented skill which may be active in almost all sensori-motor activities, singly or in combination, and memory is usually involved. When reading, one must visually recognize sequences of letters, sequences of graphemes and

sequences of words; one must auditorially recognize the phoneme sequences the graphemes symbolize. In spelling, a reverse process of recalling phonemes and graphemes occurs. Writing involves motor sequencing habits. (Bannatyne, 1968)

Visuo-Spatial Ability. Visuo-spatial ability is an intellectual-oriented term which can be defined as the ability to manipulate objects and their inter-relationships intelligently in multi-dimensional space. (Bannatyne, 1968)

CHAPTER II

REVIEW OF THE LITERATURE

Various theories of causes of reading failure in children have been expounded within the last half century. There have been those which tried to explain the failures through concomitant emotional factors. Various research studies have attempted to show a pattern of mental abilities which characterize poor reading skill. Every teacher has a number of pupils who do not achieve in a particular subject to the extent that their measured general mental ability would indicate. Essentially, the problem raised is as follows: Do most of these youngsters actually lack certain abilities or capacities basic to the reading process?

The review of literature is presented under six headings: WISC Subtests and Reading; WISC Subtests and Underachievers; WISC Subtests and the Learning Disabled Children; WISC Subtests and Spelling; Other Approaches; and Summary and Conclusions.

WISC Subtests and Reading

Bannatyne (1968) suggested that the WISC subtest scores of genetic dyslexic readers are best analyzed in terms of categories which he called Spatial, Conceptual, and Sequential. According to Bannatyne (1974), subtests in the Spatial category (Block Design, Object Assembly, and Picture Completion) require the ability to manipulate objects directly or symbolically in multi-dimensional space. Subtests in the Conceptual category (Vocabulary, Similarities, and Comprehension) require abilities more closely related to language functioning. Subtests in the Sequential category (Digit Span, Coding, and Arithmetic) require the ability to retain sequences of auditory and visual stimuli in short term memory storage. Bannatyne (1971) reported that genetic dyslexic readers received their

highest scores in the Spatial category, intermediate scores in the Conceptual category, and their lowest scores in the Sequential category.

Long before Bannatyne's (1968) recategorized WISC subtest scores, a number of studies (Barratt, 1957; Burks, 1955; Coleman, 1963; Graham, 1952; Hirst, 1960; and Neville, 1961) had attempted to ascertain whether there was a distinctive pattern of intellectual abilities, as revealed by subscale scores on the WISC, which characterizes underachievers.

Graham (1952) noted the similarity between the profile frequently obtained by the unsuccessful readers and that ascribed to adult hysterics, and tentatively hypothesized that reading, because of its communicative nature, lends itself as a ready symbol for repressed or suppressed resistance to smothering, oppressive, or hostile emotional climates encountered by the child. To recheck the unsuccessful readers' Wechsler-Bellevue profile, Wechsler tests which had been administered to 96 unsuccessful readers were withdrawn from the files of the Psychological Service for Children at the University of Denver and statistically compared. These tests had been gathered over a four-year period during the processes of clinical diagnosis. They constituted the entire population so tested who met the requirements of the operational definitions of the unsuccessful reader. The unsuccessful reader was defined as a child between the ages of 8 - 0 and 16 - 11 who achieved either a Verbal or Performance Scale IQ of 90 or higher, who had fallen 25% or more below the mean reading grade level on the Wide Range Achievement Test for a child of his chronological age. Fifty-four children had been given the Wechsler-Bellevue Form I (WBI); eleven had been given the Wechsler-Bellevue Form II (WBII); and thirty-one had been given the Wechsler Intelligence Scale for Children (WISC). The results are indicated as follows: The mean Full Scale IQ for all WB tests was 97.1 and for all WISC tests, 100.3. The mean

Verbal Scale IQ for all WB tests was 88.4, and for all WISC tests, 98.9. The mean Performance Scale IQ for all WB tests was 107.1, and for all WISC tests, 101.7. It was found that for the 96 Wechsler Intelligence Scales administered to the unsuccessful readers, Arithmetic, Digit Span, Information, Digit Symbol, and Vocabulary averaged below the mean. Object Assembly, Picture Completion, Picture Arrangement and Block Design were generally the higher performance scale tests.

In another study, Flanary (1954) compared 90 disabled readers (who were one or more years below the expected level) with 20 normal readers. The subjects ranged from 12 to 16 years of age, and the IQ of the disabled readers were from 67 to 128. The subjects were all given the WISC. The scores clearly indicated that the reading disabled adolescents did well on the Block Design, Object Assembly and Picture Completion subtests, but scored well below the means on Digit Span, Coding, and Picture Arrangement subtests. The normal readers, on the other hand, did well on the Comprehension, Picture Arrangement and Similarities subtests and not so well on the Digit Span, Coding and the Vocabulary subtests. Incidentally, when the subtest scores were re-arranged as suggested by Bannatyne (1971) into Spatial, Conceptual and Sequential, the disabled readers corresponded with the findings of Bannatyne's genetic dyslexic readers in that their Spatial score was the highest, next was the Conceptual scores, and the lowest was the Sequential scores, while the normal readers had a different pattern. Their highest scores were in the Conceptual category, intermediate in the Spatial category, and the lowest, also, in the Sequential category.

Burke and Bruce carried out a study in 1955 on poor and good readers in the San Gabriel School District in Iowa. The subjects of this investigation included 11 good readers (one or more years above

grade level on the reading section of the Wide Range Achievement Test), and poor readers (one or more years below grade level on the reading section of the WRAT), all of whom were given the WISC. They ranged in grade levels from third through eighth grades. The 11 good readers were made up of 6 girls and 5 boys; the group of 31 poor readers contained 5 girls and 26 boys. All of the children had IQ scores above 90, therefore they reasonably could be expected to read at least at grade level. The average Full Scale IQ score of the good group was 117, and the average Full Scale IQ score of the poor group was 101.

The 31 poor readers did well on the three subtests, Comprehension, Block Design, and Picture Arrangement, and low on Coding, Information, and the Arithmetic subtests. In comparing these scores with the scores of the small group of good readers, it was noted that poor readers did best on the Picture Arrangement subtest in which the good readers were poorest. These investigators concluded that the poor readers scored lowest on those subtests most dependent on memory function and highest on those least dependent on symbolic memory. The poor readers, as a group, approached learning situations in a more concrete manner as a result of an inability to handle abstractions. Since the reading process consists inherently of abstractions strongly depending on memory function, these children are handicapped. The good readers, on the other hand, do not show this lack of ability to use abstractions and have much more retentive ability.

Neville (1961) compared the WISC scores of a group of 35 children who were retarded two or more years in reading with a group of 35 nonretarded readers. The groups were matched for IQ, grade level, and sex. All of the children had WISC IQ's of 90 or above and all were boys. In

addition, the subjects in both groups had been referred to the clinic because of a suspected reading problem. There were no subjects included in either group who were referred for further physical or psychological evaluation.

The scores of retarded readers differed significantly from non-retarded readers in performance and verbal tasks in general as well as in the Information, Arithmetic, Digit Span, Picture Arrangement, and Block Design subtests. Neville found that the retarded readers scored significantly below the mean on the Information, Arithmetic and Digit Span subtests, and significantly above the mean on the Picture Arrangement and the Block Design subtests. He also noted that the retarded readers do poorest on those subtests more nearly resembling verbal-type school learning and those requiring sustained concentration. However, their best performances occur in those subtests clearly removed from verbal skills and in activities divorced from school tasks. It was also suggested that their excellent performance on the Picture Arrangement subtest results from long practice at using pictures as clues to the context of the printed page, which they are unable to read.

In 1963, McLean compared the WISC subtest performances of four groups of elementary school boys in grades 4, 5, and 6, who apparently differed only with respect to emotional adjustment and/or reading ability. There were 21 children in each group, and they were carefully matched with IQ ranging from 90 to 110, and ages between 10 and 12 years. These four groups were labelled according to criteria as well adjusted retarded readers and well adjusted non-retarded readers; and as emotionally disturbed retarded readers and emotionally disturbed non-retarded readers. The major purpose was to determine what effects the adjustment factor has

on the WISC subtest profiles of retarded and non-retarded readers. All four groups had Full Scale IQ's falling close to the mean of their age group. Inter-group differences in mean Performance and Full Scale IQ's were non-significant. Comparison of Verbal IQ's revealed both retarded groups to be significantly lower in verbal abilities than the non-retarded reader groups. Intra-group comparisons also revealed the retarded readers to have significantly lower Verbal than Performance IQ's. No intra-group differences in IQ appeared in the non-retarded reader groups. A comparison of the subtest raw score means of the four groups revealed no significant differences existed between groups on five subtests. These were Comprehension, Similarities, Picture Arrangement, Block Design, and Object Assembly. Either one or both of the non-retarded reader groups scored significantly higher than one or both of the retarded reader groups on all other subtests, except one. On Picture Completion, both retarded groups scored higher than both non-retarded reader groups.

Both the emotionally disturbed and well adjusted disabled readers had the same pattern of recategorized scaled scores as predicted by Bannatyne, with Spatial greater than Conceptual, which, in turn, was greater than the Sequential.

Johnson et al (1965) had a similar result with 60 disabled readers. The 60 children between the ages of 7 and 18 years and between the Full Scale IQ of 89 and 129, who were classified primarily as dyslexic, were studied to determine the nature of their problem and to explore the most effective means of remediation. All of the children were referred because of school difficulties, and all were enrolled in the educational training program at the Institute for Language Disorders. Every child was seen for a diagnostic study and had at least three months of remedial work

which further clarified or substantiated the original diagnosis.

The mean score of the Spatial category was 11.86, for the Conceptual category 10.66, and for the Sequential category 9.46, thus manifesting the same pattern as predicted by Bannatyne with his learning disabled subjects. Taken as a group, the mean scores of the intelligence subtests are not particularly revealing, with the exception of auditory digit span, for which the mean score was 8.5. The results showed that these disabled readers scored highest on Block Design, Object Assembly, Picture Arrangement, and Similarities subtests, and poorest on Digit Span, Arithmetic, and Vocabulary subtests.

In 1969, Lyle et al compared 54 retarded readers (experimental group) and 54 adequate achievers (control group). All were selected from primary schools in Sydney. Each group consisted of 9 subjects from each of the six primary school grades, which ranged in age from 6 years to 12 years. Schools were situated in middle class suburban areas to reduce the probability of selecting children whose poor achievement was due primarily to adverse conditions for home study. The subjects were each given the WISC test. The normal readers scored highest on Arithmetic, Information, Vocabulary, and Coding subtests, while the disabled readers scored highest on Picture Arrangement, Picture Completion, Block Design, and Comprehension subtests, and poorest on Coding, Arithmetic, and Information subtests. However, the results of the subtests of both groups showed the same profile of abilities that Bannatyne (1971) found for the disabled readers, i.e., highest scores in the Spatial category, intermediate scores in the Conceptual category, and lowest scores in the Sequential category.

In 1971, Hunter and Johnson compared 20 boys with reading disability and aged from 7 to 11 years and from 11 to 4 years with 20 normal,

matched controls to examine how non-readers differ from children who read at age-grade level or better. The reading disability group had a mean retardation in reading proficiency of 2.4 years; the control group was accelerated in reading skills by a mean of 1.9 years. Most of the subjects were in either the fourth or fifth grades in public school. The 4 third graders in the study were "holdovers" because of severe deficits in reading. Mean age-grade level for the reading disabled readers was 4.2; mean age-grade level for the control group was 4.7. Each child was given the WISC. The WISC scores for the two groups were as follows: Full Scale WISC scores for the reading disabled readers ranged from 92 to 131 ($X = 112.3$, $S.D. = 9.7$), and for the control group from 93 to 136 ($X = 118.8$, $S.D. = 10.0$). The difference between the groups with respect to WISC Full Scale scores was not statistically significant, nor was there a significant difference between reading disabled readers and control group readers relative to WISC Performance IQ's, which were 112.3 and 111.6 for the reading disabled group and the control group respectively. Reading disabled readers characteristically demonstrated higher Performance IQ's than Verbal IQ's. All reading disabled readers had a Performance IQ of 90 or above. The control group was significantly superior to the reading disabled readers on WISC Verbal IQ and on WISC subtests on Information, Vocabulary, Digit Span, Arithmetic, Similarities, and Coding. A "tested attention" score (the sum of WISC, Arithmetic and Digit Span subtests) was compared for each child. Tested attention scores not only discriminated significantly between reading disabled readers and control group, but also correlated highly with reading ability, as measured by WRAT.

WISC Subtests and Underachievers

Altus (1956) conducted a study dealing with 25 children with normal intelligence and severe learning difficulties. All children in the sample had been referred to the Guidance Department of the Santa Barbara County Schools by their teachers because of severe academic disabilities. All had Full WISC IQ's of 80 or more, spoke only English at home, had taken at least four subtests on each WISC scale, and were between third and eighth grade when given the reading test. A group of 25 children from 12 elementary schools met these criteria. Twenty-four of them were boys - an exaggerated representation of the usual finding that boys outnumber girls as reading problems. The intelligence of the group was normal. Mean WISC IQ's were 97.8, 100.4 and 98.6 on the Verbal, Performance, and Full Scales respectively. There was less variability in the sample than in an unselected population as shown by standard deviations of 9.9, 10.3 and 9.2 IQ points on the same scales. Since the mean Verbal-Performance IQ discrepancy was negligible, it was clearly not differentially diagnostic. However, the subtest patterning appears to be fairly distinctive. Coding and Arithmetic are significantly lower than Vocabulary, Digit Span, Picture Completion, Object Assembly and Picture Arrangement at the .01 level of confidence. The Information subtest was signficantly lower than Picture Completion at the .01 level, and lower than Vocabulary and Digit Span at the .02 level of confidence. Had the positive correlations among the various subtests been taken into account in computing the significance of differences between subtest means, the chances of true differences would have been increased and similarities would probably also have been included in the "low" subtests.

The obtained WISC pattern was strikingly similar to the findings reported by Altus (1956) regarding the differential validity of Wechsler-Bellevue subtests in predicting graduation of trainees from a camp for illiterate soldiers. In Altus' 1956 study, Arithmetic, Information and Digit Symbol (Coding) subtests were shown to be highly effective in predicting graduation. The mean Spatial score was 10.6, mean Conceptual score was 10.03, and the mean Sequential score was 9.23.

Approaching the problem from a somewhat different point of view, Barratt and Baumgarter (1957) utilized two groups of elementary school children, 30 achievers and 30 non-achievers. Achievers and non-achievers were defined by teacher ratings of reading, arithmetic, and general school performance. They found that achievers had an average WISC Full Scale IQ of 117, and the non-achievers an average of 87, and that the achievers scored significantly higher on all the subtests of the California Achievement Test. On the WISC, achievers ranked highest on the Information, Vocabulary, Arithmetic, Comprehension, and Similarities subtests. Non-achievers ranked highest on Coding, Object Assembly, Picture Arrangement, and Block Design subtests.

Hirst (1960) utilized a two-way analysis on the WISC subtest scores of 30 remedial reading classes. All had WISC IQ's of 89 or above (mean 109), all were retarded 6 months or more in reading achievement in relation to their Mental Age, and all were within the age range of 8 to 0 and 13 to 6 (mean 10.3). The underachievers, evaluated as a total group of underachievers, scored significantly above the mean on the Picture Completion and Picture Arrangement subtests, and below the mean on Arithmetic, Digit Span, and Coding subtests. Approximately the same results were found for mild and severe underachievers, except that the

severe underachievers also made scores significantly above the mean on Object Assembly and below the mean on the Similarities and Vocabulary subtests.

In 1973, Bush and Mattson compared the WISC test pattern of 28 bright and gifted underachievers with those of 23 bright and gifted achievers. A comparison also was made of 36 normal level underachievers and with 22 normal level achievers. The subjects for this 1973 study were selected from among underachieving children who had been referred for psychological evaluation from the public schools by parents, teachers, and doctors. Criteria for subjects were failure by grade or subject, and WRAT reading and spelling discrepant standard scores of 14 points, and arithmetic discrepant scores of 12 points below their WISC Full Scale IQ. The intellectual levels were established on the basis of standard deviation of intelligence quotients. The normal level group IQ's were limited to the range of 83 to 117. The bright and gifted group was limited to IQ's of 118 and above on either the WISC Verbal or Performance scales. The major instrument used was the Wechsler Intelligence Scale for Children. The data was then analyzed by a series of successive comparisons, and tests were run to determine significant differences. Means were first established on subtests: Information, Comprehension, Arithmetic, Similarities, Vocabulary, Digit Span, Picture Completion, Picture Arrangement, Block Design, Object Assembly, and Coding. Following this, 't' tests were run between these means on the groups of underachievers and achievers at the normal level and at the bright and gifted level. All four groups did not have the same pattern of what Bannatyne predicted of the genetic dyslexic readers in 1968. However, the four groups scored highest in the Conceptual category, next the Spatial category, and lowest also in the Sequential category.

WISC Subtests and the Learning Disabled Children

In 1963, Coleman was concerned with the question of whether a learning disordered population showed a distinctive pattern of intellectual abilities as revealed in WISC subtests. The subjects were 126 underachievers and 20 overachievers referred to the Psychology Clinic School (PCS) for psychological evaluation. All of the underachievers were one or more years retarded in achievement in relation to their age and grade placement as reflected on the California Achievement Test (CAT) or the Stanford Achievement Test (SAT). The mean underachievement was approximately 3 years, with a range of 1 to 6. The mean WISC Full Scale IQ for the underachievers was approximately 100, with a range from 70 to 136; the chronological age range from 7.5 to 16 with a mean of approximately 11. The group of overachievers was one or more years advanced in relation to age grade expectancy as reflected by scores on the CAT or SAT. The range of overachievement was 1 to 4 years, with a mean of approximately 2.5. The overachievers had a mean WISC Full Scale IQ of 119, with a range of 111 to 137. The chronological age range was approximately 10 to 15, with a mean of slightly over 12. All of the overachievers had been referred to the PCS because of failing grades in their regular school setting.

The key findings of Coleman's investigation were as follows: (1) Underachievers as a group scored significantly low on WISC subtests, which factor analytic studies have shown to be heavily loaded with school type learning, sustained concentration and memory factors. Conversely, they made significantly high scores on WISC subtests heavily loaded with perceptual organization and informal learning. (2) The WISC pattern characteristic of underachievers was not affected by age, and affected

only slightly by intelligence and degree of underachievement, thus pointing to the relative homogeneity of the patterning of intellectual abilities among underachievers as reflected on the WISC. (3) Overachievers, experiencing serious academic difficulties, showed a characteristic WISC pattern which differed markedly from that of underachievers, having high scores on subtests heavily loaded with school type learning, and a significantly lower mean score on the Performance as contrasted with the Verbal Scale. Overachievers also showed a high degree of scatter on the WISC subtests, which may reflect emotional problems relevant to their academic difficulties.

In 1966, Schiffman, et al, had a similar finding with 240 children. The group of children studied in the Central Evaluation Clinic for Children, was a highly selected and screened population who had been referred for evaluation. It was decided to study a large number of children with learning disabilities found in one large public school (Baltimore County) system. Accordingly, 240 children with severe reading problems which could not be remediated by supplementary pedagogic methods were studied in an experimental project in an effort to clarify the nature and characteristics of these children. The children were frequently characterized by associative learning disability, inadequacies in memory span, deficiencies in concept formation, and possible neurological and/or emotional complications. Pupils with these problems demand individual and small group instruction on a clinical basis by specially trained personnel. It is for these reasons that the tactile and kinesthetic techniques are usually necessary. The children were each given a WISC test. The children as a group did poorly on Digit Span, followed by Information, Arithmetic, and Coding. The results suggested that disabled readers as a whole show the same profile of abilities that

Bannatyne suggested for the genetic dyslexic readers - highest scores in the Spatial category (Block Design, Object Assembly, and Picture Completion), intermediate scores in the Conceptual category (Vocabulary, Comprehension, and Similarities), and lowest scores in the Sequential category (Digit Span, Coding and Arithmetic).

In 1971, Ackerman, Peters and Dykman reported a study of the WISC profiles of children with specific learning disabilities. The subjects were 82 boys with learning disabilities and 34 academically adequate boys (controls). They were all Caucasians, and they ranged in age from 8 years to 11 years and 11 months. No subjects were culturally impoverished; most were from middle class families. All were in good physical health and without limiting physical handicaps. All the children with learning disabilities had in common the experience of failure or imminent failure in school despite having what on the surface appeared to be the necessary assets for success. That is, each child included had either a Verbal or Performance IQ on the WISC of 90 or higher; he had no limiting physical handicaps; he came from a culturally adequate home; and, insofar as could be determined from home and school reports, his difficulty in school did not stem from emotional instability. The control group was chosen from the Little Rock Public School in Arkansas, while the experimental group was chosen from the children who were referred to the University of Arkansas Child Study Center because of school problems. All controls were given the WISC by one of several psychological examiners in the Child Guidance Clinic. Since all of the children with learning disabilities had been given the WISC either by members of the clinic staff or by school examiners as part of their diagnostic work-up, only those WISC's administered more than 15 months prior to laboratory study were repeated by the

clinic examiners. The disabled readers scored (mean score) 11.43 on the Conceptual category, 10.86 on the Spatial category, and 9.4 on the Sequential category, while the able readers scored 12.53 on the Conceptual category, 11.3 on the Spatial category, and 11.1 on the Sequential category. Both groups scored highest on the Conceptual category, next highest on the Spatial category, and lowest on the Sequential category.

In 1977, Monte et al reported a study in which 208 children enrolled in 23 learning disability classrooms in a large metropolitan school system in the Fall of 1974. Children in these 23 classrooms constituted approximately 79% of all children assigned to learning disability classes in the school system. The remaining 21% of learning disabled children in the school system were enrolled in two schools which declined to participate in the study. Although it was impossible to verify, it was felt that the children in these two schools were comparable. The learning disability referral procedure was uniform across the school system and schools with learning disability classrooms were feeder schools, with children bussed to the special classrooms from schools without learn- disability classes. All children were school-verified as learning disabled and at the time of testing had been enrolled in learning disability classes for an average of 12 academic months. The school system initially diagnosed the population as learning disabled by the following criteria: (1) Severe academic deficits, usually of two or more years, and in one or more areas. (2) A Full Scale IQ score of at least 75 on previous testing. (3) No severe problem in vision and/or hearing, as indicated by corrected vision of at least 20/40 and corrected audition to at least the 30 db level for pure tones through the critical speech range. The children

ranged in age from 6 years and 3 months to 12 years and 1 month. The mean age was 9 years and 9 months. The 208 children were 76% male and 81% Caucasian. The WISC-R was administered individually to children by trained personnel of the George Peabody College Child Study Center. The sample was divided into high and low IQ subgroups by using a normality criterion that embodied both an overall (Full Scale) minium IQ (76) and a requirement that the child obtain either a Verbal or Performance IQ of at least 90. Of the total sample of 208 school-labeled learning disabled children assessed in this study, 37% were found not to have the prerequisite of normal intellectual ability as determined by the criterion of a Full Scale of at least 76 and either a Verbal or Performance IQ of at least 90. The patterns of mean WISC-R subtest scaled scores, however, were similar for the two subgroups, especially among the performance subtests. For both subgroups, the highest mean Verbal scaled score was obtained on the Comprehension subtest, while the lowest scores were obtained on the Arithmetic and Information subtests. On the Performance subtests, moreover, the highest mean scores for both subgroups were obtained on the Object Assembly and Picture Completion subtests, while the lowest score was obtained on Coding. For both subgroups, the mean Performance IQ was significantly greater than the mean Verbal IQ. For both subgroups, 4 of the 5 Performance subtest mean scores were greater than the highest Verbal subtest mean score. Yet in both subgroups the fifth Performance subtest mean (Coding) was almost as depressed as the lowest Verbal subtest means (Information and Arithmetic).

The "peaks" and "valleys" in subtest scaled scores hypothesized by Bannatyne (1968, 1971, 1974) are clearly manifest in this study, and the pattern of subtest scores corresponded closely to his earlier predictions. As we have seen, Bannatyne advocated that subtest scaled

scores should be recategorized into Spatial (Block Design, Object Assembly, and Picture Completion), Conceptual (Vocabulary, Similarities, and Comprehension), and Sequential (Coding, Arithmetic, and Digit Span) categories, and predicted that learning disabled children would score highest on the Spatial category, lowest on the Sequential category, and intermediate on the Conceptual category. The relatively depressed scores on Coding and Arithmetic, and the relatively elevated scores on Block Design, Object Assembly, and Picture Completion in this investigation provided some support for Bannatyne's recategorization scheme.

WISC Subtests and Spelling

Rice (1970) divided 190 subjects into six different learning disability categories and one non-disability category: (1) reading, spelling and arithmetic, (2) reading and spelling, (3) reading only, (4) spelling and arithmetic, (5) spelling only, (6) arithmetic only, and lastly (7) no significant disability categories. The majority of these cases have come from average or above average socioeconomic backgrounds where it appears that the child's early development provided adequate environmental stimulation, adequate motivation, and adequate educational opportunities. This clinical population, due to the fact that the most serious implications of social and cultural deprivation have been eliminated, provides an excellent opportunity to study learning disabilities. A close inspection of the data gathered might assist in viewing the question of why many students fail in the usual school setting when their early developmental opportunities are those usually considered as quite acceptable. In the first category (reading, spelling and arithmetic), there were 38 subjects in which 35 of them were male and 3 of them female. Their age ranged from 7 years and 4 months to 14 years and 10 months, with a mean age of nine

years and 11 months. Their grade ranged from grade one to grade nine. The Full Scale IQ ranged from 88 to 133 with a mean of 109.55. Their Verbal IQ ranged from 85 to 129, with a mean Verbal IQ of 106.55. Their Performance IQ ranged from 86 to 135 with a mean of 110.95. In the second category (reading and spelling disability), there were 43 subjects in which 36 of them were male and 7 of them female. Their ages ranged from 6 years and 6 months to 15 years and 3 months, with a mean age of 10 years and 2 months. Their grade placement was from grade one to grade ten. The Full Scale IQ ranged from 87 to 120 with a mean Full Scale IQ of 100.94; the Verbal IQ ranged from 79 to 138 with a mean of 99.65; and the Performance IQ between 89 and 129, with a mean of 103.19. In the fourth category, (spelling and reading disability), there were 4 subjects in which 3 of them were male and 1 female. Their age ranged from 8 years and 2 months to 11 years and 1 month, with a mean age of 10 years. The grade placement was from grade three to five. The Full Scale IQ ranged from 106 to 124, with a mean of 115.50; their Verbal IQ between 104 and 137, with a mean of 119.0; and their Performance IQ was between 105 and 115, with a mean of 108.75. The fifth category, (spelling only disability), there were 10 subjects with 8 male and 2 female. Their age ranged from 8 years to 12 years and 3 months, with a mean of 9 years and 2 months. Their grade placement was from grade two to six. Their Full Scale IQ ranged from 89 to 108, with a mean Full Scale IQ of 98.0. Their Verbal IQ was between 89 and 110, with a mean of 97. Their Performance IQ was between 87 and 110, with a mean IQ of 99.7. Only the Spelling disability group manifested the pattern as predicted by Bannatyne in which the Spatial category is greater than the Conceptual category, which, in turn, is greater than the Sequential category. The other 3 groups had a different pattern of

Conceptual greater than Spatial, which, in turn, was greater than the Sequential category.

Naidoo (1972) also compared two groups of children. There were 41 boys, who had spelling problems, while the control group consisted of 42 boys who did not have spelling problems. The mean Full Scale Score for the spelling retardates was 119, while the mean Verbal IQ was 117.3, and the mean Performance IQ was 117.7. The control group had a mean Full Scale IQ of 120.5 with a mean Verbal IQ of 120.5 and a mean Performance IQ of 116.4. The result showed that the spelling retardates did well on the Block Design subtest, followed by the Vocabulary and the Similarities subtests, while the control group did well on the Vocabulary, Similarities, and Block Design subtests. The mean Full Scale, Verbal and Performance IQ's of the spelling retardates were very similar to those of their controls. A discrepancy of 20 points or more between the Verbal and Performance IQ was found with equal frequency in both positive and negative directions among the spelling retardates, whereas among the controls the Verbal IQ tended to be higher. The spelling retardates obtained significantly lower scores on Information, Arithmetic, Digit Span, and Coding. The spelling retardates had a mean Spatial score of 13.5, a mean Conceptual score of 13.4, and a mean Sequential score of 10.7. The control group had a mean Spatial score of 12.8, a mean Conceptual score of 13.3, and a mean Sequential score of 12.4.

In 1974, 71 children from the age of 8 to 14 years were chosen by Nelson and Warrington. They compared 17 spelling-only retardates of whom 15 were male and 2 female, and 54 spelling-and-reading retardates of whom 45 were male and 9 female. The mean chronological age of the spelling retardates was 12.5, and their mean Verbal IQ was 114.2, and

their Performance IQ was 117.6. The mean chronological age of the spelling-and-reading retardates was 11.6, with a mean Verbal IQ of 99.1, and a mean Performance IQ of 113.4. Each child was given the WISC test. The result confirmed that the children who were retarded in spelling produced a different pattern than those who were spelling and reading retarded. Unlike the spelling-and-reading retardates, the spelling-only retardates did not have a significantly low verbal IQ. However, like the spelling-and-reading retardates, they also scored the lowest on the Digit Span subtest. Both groups had the lowest scores in the Sequential category. But only the spelling-and-reading retardates had the same pattern as predicted by Bannatyne (1968) with the highest scores in the Spatial category, intermediate in the Conceptual category, and the lowest in the Sequential category.

Other Approaches

The considerable literature on other aspects of diagnostic interpretation of WISC and WISC-R scores will not be reviewed here. However, attempts to relate patterns of subtest scores to perceptual and cognitive styles (e.g. Keough, 1973; Stevenson, 1980) to broad groupings of perceptual disabilities (e.g. Rourke, et al, 1973; Miller, et al, 1978), and to the development of remedial hypothesis for disabled readers (Wallbrown, et al, 1979) should be noted. There has, in fact, been considerable disagreement in the literature concerning the extent to which it is legitimate, solely on the basis of WISC or WISC-R scores, to differentiate between populations or subgroups of learning or academically disabled children.

In this context, the concluding remarks of the protagonists in a recent controversy in the Journal of Learning Disabilities are worth

quoting:

> A larger question is one that would interest most readers...that is, are their scores on the WISC-R distinctive enough to separate out certain groups of students? ...If one uses WISC-R scores to show distinctive characteristics of certain subgroups, then one is obligated to show that these scores are different from normal. Otherwise they are not distinctive.
>
> (Miller, 1980)

> What we presented was a set of clinical hypotheses that may prove useful in generating remedial strategies for certain children (but not all) if they are congruent with other information. In fact, we specifically caution that 'a WISC-R profile never constitutes an adequate basis for generating a remedial strategy, but if used with other information, it can sometimes provide a valuable source of information about a child's ability pattern'.
>
> (Wallbrown, et al, 1980)

Summary and Conclusions

According to Bannatyne (1974), subtests in the Spatial category (Block Design, Object Assembly, and Picture Completion), require the ability to manipulate objects directly or symbolically in multi-dimensional space. Subtests in the Conceptual category (Vocabulary, Similarities and Comprehension), require abilities more closely related to language functioning. Subtests in the Sequential category (Digit Span, Coding, and Arithmetic), require the ability to retain sequences of auditory and visual stimuli in short term memory storage.

A review of studies utilizing Bannatyne's theory of recategorizing WISC subtests into Spatial, Conceptual, and Sequential categories shows that disabled readers, underachievers, and spelling retardates usually manifest a pattern in which Spatial scores are greater than

the Conceptual scores, which, in turn, are greater than the Sequential. These results are similar to those found by Bannatyne in 1968 and 1971, which apply to genetic dyslexics.

Only two of the studies reviewed included analyses of spelling performance. It would be of interest to discover whether a population defined according to its spelling performance would fit Bannatyne's theory.

CHAPTER III

DESIGN OF THE STUDY

The purpose of the study was to compare the recategorized WISC-R scores of good and poor spellers, involving a Spatial score, a Conceptual score, and a Sequential score, as suggested by Bannatyne (1974).

In this chapter, the description of the nature of the sample, the materials used to collect the data, and the procedures followed are discussed under the headings: Population and Sample; Instruments; Hypotheses; Procedures; and Analysis of Data.

Population and Sample

The population for this study was composed of grade six students in a school district in the Vancouver Metropolitan area. The sample consisted of grade six students in five classes from four volunteering schools within the school district. The total number of students in the five classes was 115. It was anticipated that each of the two groups of students (good and poor spellers) would reach an N of 35 students. However, only 29 of the good spellers (14 males and 15 females) and 31 of the poor spellers (22 males and 9 females) participated in the taking of the WISC-R standardized test. The children ranged in age from 11 years and 2 months to 13 years and 3 months. The mean age was 11 years and 11 months. The population selected was thus defined solely and specifically with respect to performance on a spelling test and on the WISC-R. No other diagnostic assumptions were made regarding other abilities or disabilities in this population.

Instruments

1. Spelling Tests. A 50-word spelling test was composed by taking a random sample of 50 words from the words that had been taught by the teachers using Spelling in Language Arts, 1964, since September 1979. As all the students had studied these words as part of the spelling curriculum, it was considered to be a valid way of compiling an appropriate spelling test.

2. WISC-R. The WISC-R test was given to each student in the sample of good and poor spellers individually, and each subtest score was analyzed in terms of Bannatyne's Spatial, Conceptual, and Sequential scores as well as the usual Verbal and Performance scores. The WISC-R test was chosen because it was necessary to test Bannatyne's theory and because the WISC manual reported split half reliability coefficients for the Verbal, Performance, and Full IQ scales and for 10 of the 12 subtests. Coefficients are presented for ages 7½, 10½, and 13½ years. The reliability coefficients are .92 to .95 for the Full Scale, .88 to .96 for the Verbal Scale, and .86 to .90 for the Performance Scale. Reliability and stability studies provide continued support for the WISC as a reliable and stable instrument (eg.Caldwell, 1954; Gehman & Matyas, 1956; Jones, 1962) for normal, emotionally disturbed, and mentally retarded children, and that it provides stable IQ's. The Verbal, Performance, and Full IQ's on the WISC are standard scores with means of 100 and standard deviations of 15. This procedure for calculating IQ's is particularly valuable for IQ's at each age level are comparable throughout the range of the test.

Hypotheses

Hypothesis 1. There is no statistically significant difference (α = .05) between the mean score (Spatial: WISC-R) of designated poor spellers and the mean score of designated good speller.

Hypothesis 2. There is no statistically significant difference (α = .05) between the mean score (Conceptual: WISC-R) of designated poor spellers and the mean score of designated good spellers.

Hypothesis 3. There is no statistically significant difference (α = .05) between the mean score (Sequential: WISC-R) of designated poor spellers and the mean score of designated good spellers.

Procedures

Five classes of grade six students (115 students) in four schools in a Vancouver area were administered a 50-word spelling test. Each grade six class teacher was given the spelling list with written instructions, and was asked to administer the spelling test to all subjects within the same week. After the spelling test was scored, the results were placed in rank order. The top 35 students were selected to comprise the group of good spellers, and the bottom 35 was selected to comprise the group of poor spellers.

A letter was sent home from the teachers to the parents of the students in each group asking for parents' permission for their son/daughter to participate in the study. Of the 35 good spellers, 6 parents refused permission for the children to participate in the study, and thus the size of the good speller population was reduced to 29 (14 males and 15 females). Of the 35 poor spellers, 4 parents refused permission for the children to participate in the study, and thus the size of the poor speller population was reduced to 31 (22 males and 9 females).

Each student of the good spelling group and the poor spelling group was then tested individually with the WISC-R standardized test. The collection of the data was confined to a three-week period. The WISC-R subtests were then recategorized into Bannatyne's Spatial score

(Block Design, Object Assembly, and Picture Completion subtests); Conceptual score (Vocabulary, Similarities, and Comprehension subtests); and Sequential score (Digit Span, Coding, and Arithmetic subtests), along with the usual practice of analyzing WISC Verbal Scale-Performance Scale scores. The results of the subtest scores of the two groups were then compared.

Analysis of Data

The research method used for this study was the descriptive-comparative method. The basic comparative design involved selecting two groups which differ on an independent variable (spelling), and comparing them on three variables (Spatial, Conceptual, and Sequential scores: WISC-R). A difference between the two groups already existed (good and poor spellers), and the two groups were not manipulated by the researcher. The WISC-R standardized test was used to obtain the desired information from the good and the poor spellers in order to compare them with Bannatyne's theory.

The descriptive statistics determined in this study were the means and standard deviations. The means and standard deviations of the Spatial, Conceptual, and Sequential scores are recorded, as well as the Verbal, Performance, and Full Scale IQ scores.

An inferential statistic, namely the 't' test, was used in this study. An alpha of .05 was chosen because it is the most common and popular level of statistical significance used in research of this kind. The 't' test was considered appropriate because (1) the underlying measurement scales for the dependent variables used were considered quasi-interval in nature, and (2) the underlying assumptions of the 't' test were largely met, namely representative selection of subjects, normal distribution of population scores and equality of the individual group variances.

CHAPTER IV

RESULTS

The recategorized WISC-R scores of good and poor spellers were compared involving a Spatial score, a Conceptual score, and a Sequential score, as suggested by Bannatyne (1974).

Hypothesis 1 was supported in this study. There was no statistically significant difference (α = .05) between the mean score (Spatial: WISC-R) of designated poor spellers and the mean score of designated good spellers.

Hypothesis 2 was rejected in this study. There was a statistically significant difference (α = .01) between the mean score (Conceptual: WISC-R) of designated poor spellers and the mean score of designated good spellers.

Hypothesis 3 was rejected in this study. There was a statistically significant difference (α = .001) between the mean score (Sequential: WISC-R) of designated poor spellers and the mean score of designated good spellers.

Table 1 represents the mean WISC-R subtest scores of the good and poor spellers. The good spellers scored the highest mean in the Comprehension subtest, followed by Coding and the Block Design subtests. The poor spellers scored the highest mean in the Object Assembly subtest, followed by Block Design and Picture Arrangement subtests. The good spellers scored lowest in the Picture Completion subtest, followed by Information and Picture Arrangement subtests. The poor spellers, on the other hand, scored lowest in the Information and Digit Span subtests, followed by Arithmetic and Vocabulary subtests.

Table 1

Means WISC-R Subtest Scores of Good and Poor Spellers

	Good Spellers	Poor Spellers
Verbal Tests		
Information	9.96	8.16
Similarities	10.75	9.32
Arithmetic	10.58	8.32
Vocabulary	10.65	8.83
Comprehension	12.44	10.64
Digit Span	10.68	8.16
Performance Tests		
Picture Completion	9.06	9.22
Picture Arrangement	10.13	10.77
Block Design	11.89	11.51
Object Assembly	11.55	12.12
Coding	12.00	9.77

Table 2 presents the means and standard deviations for the Full Scale, Verbal and Performance IQ, and the recategorized WISC-R scores. Bannatyne's predicted order of "Spatial > Conceptual > Sequential" was manifest for the total sample, as well as for the poor spellers, but not for the good spellers. Statistical analyses of the recategorized WISC-R scores are discussed below, separately for each classification of children.

Table 2

Means and Standard Deviations of WISC-R Scores for the Good and Poor Spellers

	Good Spellers N = 29		Poor Spellers N = 31		Total Sample N = 60	
	Mean	SD	Mean	SD	Mean	SD
I.Q. Scores						
Full Scale	104.68	9.39	98.19	10.59	101.33	10.62
Verbal	103.79	10.66	93.51	11.82	98.48	12.39
Performance	105.48	12.14	104.41	12.66	104.93	12.42
Recategorized Subtest Scores						
Spatial	10.83	2.03	10.94	2.21	10.88	2.11
Conceptual	11.28	2.34	9.61	2.28	10.44	2.45
Sequential	11.08	1.73	8.74	1.58	9.91	2.03

Total Sample (N = 60)

The mean Full Scale IQ of the total sample was 101.33 with a mean Verbal IQ of 98.48 and a mean Performance IQ of 104.93. The mean Spatial score was 10.88, the mean Conceptual score was 10.44, and the mean

Sequential score was 9.91, thus manifesting Bannatyne's predicted order of Spatial score is greater than Conceptual score which, in turn, is greater than the Sequential score.

Good Spellers (N = 29)

The mean Full Scale IQ of the good spellers was 104.68 with a mean Verbal IQ of 103.79 and a Performance IQ of 105.48. The mean Spatial score for the good spellers was 10.83, the mean Conceputal score was 11.28 and the mean Sequential score was 11.08. According to this research, it suggests that the good spellers were highest in the Conceptual score, next highest in the Sequential score, and lowest in the Spatial score. However, since the differences are small, this conclusion is tentative.

Poor Spellers (N = 31)

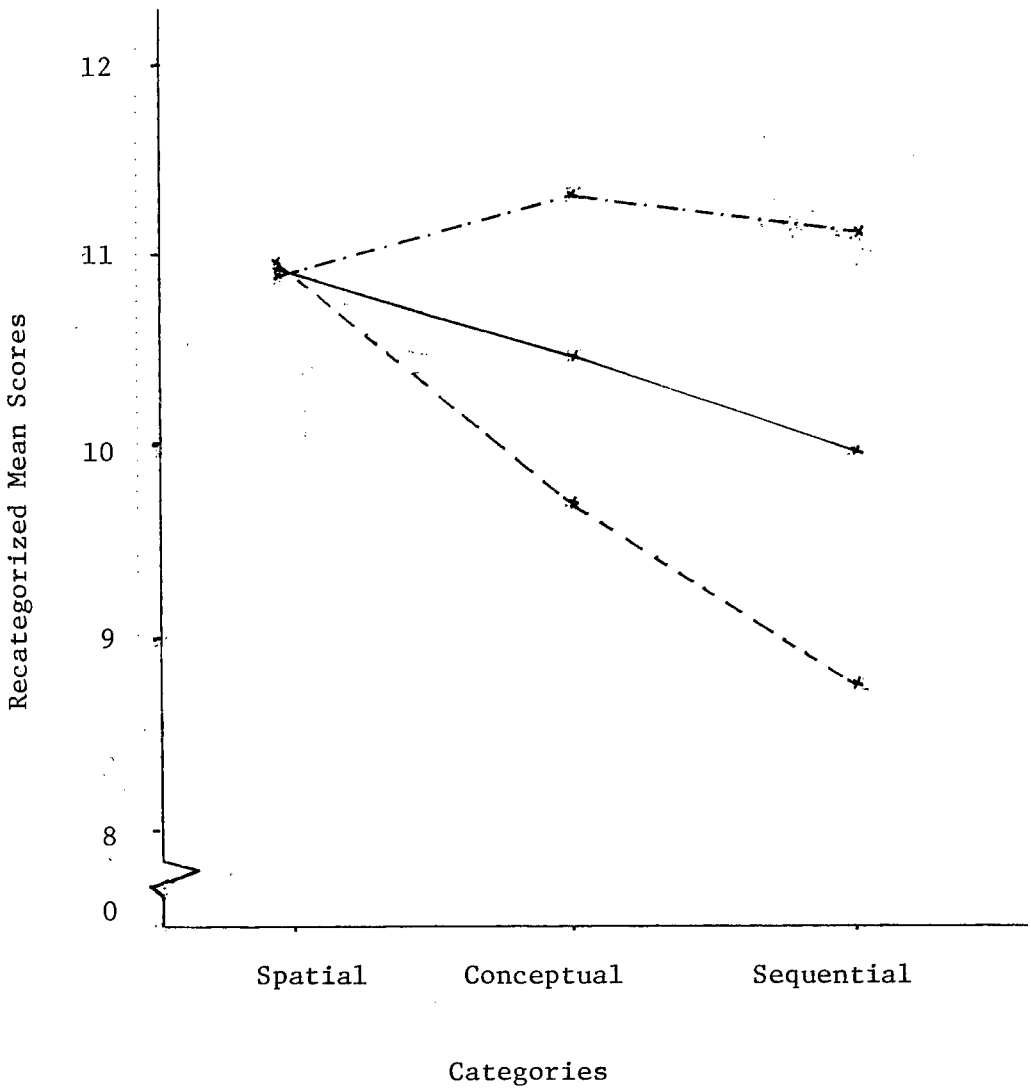
The mean Full scale IQ of the poor spellers was 98.19 with a mean Verbal IQ of 93.51 and a mean Performance IQ of 104.41. The mean Spatial score for the poor spellers was 10.94, the mean Conceptual score was 9.61, and the mean Sequential score was 8.74, thus manifesting Bannatyne's predicted order of Spatial score is greater than Conceptual, which, in turn, is greater than Sequential.

The patterns of the recategorized mean scores for the total sample, the good spellers and the poor spellers, are graphically depicted in Figure 1.

FIGURE I

Mean Recategorized WISC-R Subtest Scores

for Total Sample, Good Spellers and Poor Spellers



Analysis of Means

A 't' test showed that there was no statistically significant difference between the good and the poor spellers in the Spatial scores (Table 3). The 't' test also showed that there was a statistically significant difference between the two groups in the Conceptual score at the .01 level. There was also a significant difference at the .001 level between the two spelling groups in the Sequential category. A 't' test also showed that there was a significant difference at the .05 level between the two spelling groups in the mean Full Scale IQ, a significant difference at the .001 level in the mean Verbal IQ, but no significant difference between the good and the poor spellers in the mean Performance IQ.

Table 3

Means and 't' test when Comparing
Good and Poor Spellers on WISC-R Scores

	Good Spellers N = 29 Mean	Poor Spellers N = 31 Mean	't' test Value
IQ Scores			
Full Scale	104.68	98.19	2.46*
Verbal	103.79	93.51	3.46***
Performance	105.48	104.41	0.35
Recategorized Subtest Scores			
Spatial	10.83	10.94	-0.20
Conceptual	11.28	9.61	2.75**
Sequential	11.08	8.74	5.37***

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

Rank Frequency Analysis of Recategorized Scores

The recategorized Spatial, Conceptual and Sequential scores for each child were ranked from highest to lowest in order to determine the relative frequency that each of these scores was highest, lowest, and intermediate for the 60 subjects. The analysis revealed that 50% of the children scored highest in the Spatial category, 28% scored highest in the Conceptual category, and 22% scored highest in the Sequential category. Spatial category ranked second for 23% of the children, while the Conceptual score ranked second for 47% of the children; and the Sequential score ranked second for 30% of the children. Twenty-seven percent of the children scored lowest in the Spatial category, while 25% scored lowest in the Conceptual category, and 48% of the children scored lowest in the Sequential category. Altogether, only 32% of the children obtained a pattern of recategorized scores of the Spatial is greater than Conceptual which, in turn is greater than the Sequential score.

The relative frequency also revealed the rank frequency of both good and poor spellers. The analysis revealed that 34% of the good spellers scored highest in the Spatial category, 34% scored highest in the Conceptual category, and 31% scored highest in the Sequential category.

Spatial category ranked second for 21% of the good spellers, while the Conceptual score ranked second for 45% of the good spellers, and the Sequential score ranked second for 34% of the good spellers. Forty-five percent of the good spellers scored lowest in the Spatial category, while 21% scored lowest in the Conceptual category, and 34% of the good spellers scored lowest in the Sequential category. Altogether, 21% of the good spellers obtained a pattern of recategorized scores of

Spatial category is greater than Conceptual which, in turn, is greater than the Sequential category.

The analysis revealed that 65% of the poor spellers scored highest in the Spatial category, 23% scored highest in the Conceptual category, and 13% scored highest in the Sequential category. Spatial category ranked second for 26% of the poor spellers, while the Conceptual score ranked second for 48% of the poor spellers, and the Sequential score ranked second for 26% of the poor spellers. Ten percent of the poor spellers scored lowest in the Spatial category, while 29% scored lowest in the Conceptual category, and 61% of the poor spellers scored lowest in the Sequential category. Altogether, 48% of the poor spellers obtained a pattern of recategorized scores of Spatial greater than Conceptual which, in turn, is greater than the Sequential score.

CHAPTER V

SUMMARY, CONCLUSIONS AND SUGGESTIONS

The results suggest that poor spellers are characterized by the same pattern of abilities that Bannatyne (1968, 1971) found for children with genetic dyslexic and that Rugel (1974) reported for disabled readers in general. Thus, the study provides further support for the view that children with academic and learning disabilities are characterized by a unique pattern of WISC and WISC-R subtest scaled scores. Poor spellers in this study also manifest the same pattern as learning disabled children do in the study by Naidoo (1972) or that of Nelson and Warrington (1974). Though we are not, of course, entitled to assume that poor spellers, as they have been operationally defined in this study, fit any but the most general definitions of learning disability, (e.g. Kirk, 1962).

Moreover, rank frequency analyses of recategorized scores revealed that the Spatial score was highest for 50% of the children and lowest for 27%. The Conceptual score was highest for 28% of the children and lowest for 25%. Whereas the Sequential score was highest for 22% of the children and lowest for 48%.

Conclusions

The present findings, along with Naidoo (1972), Nelson and Warrington (1974), Rugel (1974), Smith, Coleman, Dokecki and Davis (1977) appear to support Bannatyne's (1974) recategorization "as a practical diagnostic tool which reorganizes the subtest scores into a more useful and statistically valid format than Wechsler's own grouping of Verbal and Performance."

It is important to realize that the results of the present investigation with poor spellers show some significant differences from

those reported by Bannatyne (1968, 1971) with dyslexic children. Specifically, the poor spellers have done better than the good spellers in the Spatial categories (Block Design, Object Assembly and Picture Completion).

The good spellers, however, have shown very significant results beyond Bannatyne's prediction. The good spellers did best in the Conceptual categories, second best in the Sequential category, and lowest in the Spatial category.

It is, of course, impossible to draw specific conclusions from these differences, since the two studies were concerned with populations selected according to quite different criteria. However, it seems appropriate to conclude, along with Wallbrown, et al, (1980) that at best recategorized scores, or other forms of subtest analysis, provide only one of many pieces of information that may be useful to the diagnostican or remedial teacher.

What does the low Sequential recategorized score signify? Bannatyne (1971) suggested that it could represent a deficit in auditory closure and sequencing. This auditory Sequential memory deficit purportedly is crucial to the reading and spelling process. Rugel (1974) suggested that the low Sequential memory deficit, or an attentional disability was inferred. This ambiguity should be addressed by investigators in subsequent research.

While the poor spellers in this study were characterized by a pattern of high Spatial scores and spelling deficiencies, other patterns are likely to be linked to additional academic deficiencies. It is hoped that continued resesrch with the WISC-R, paired with other cognitive and perceptual instruments, will lead to a more refined procedure for identi-

fying poor spellers, a more accurately differentiated subdiagnosis, the identification of critical underlying processes, and more effective intervention strategies.

Suggestions

The final step in assessing the potential usefulness of patterns of recategorized scores will entail more work, inevitably, of a longitudinal nature. It may be possible to predict the development of severe deficiencies. If an accurate prediction of susceptibility to development of various academic deficiencies can be derived, the effort required for the necessary research would be small compared to the immense advantage provided by this information.

In this study, and in those by Naidoo (1972), and Nelson and Warrington (1974), the poor spellers were characterized by relatively elevated Spatial scores, and by relatively depressed Sequential scores. The question remains, however, does a pattern of elevated Spatial and relatively depressed Sequential scores predict severe reading and/or spelling disability, overall average IQ notwithstanding? If all children entering first grade in a given school system were administered the WISC-R would the information permit above-random accuracy in predicting subsequent spelling (or other) disability? The crux of the potential utilization of recategorized scores in this manner is that the earlier a tendency for development of severe academic deficiencies is identified, the earlier preventive and/or remedial work may begin.

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APPENDIX A

THE UNIVERSITY OF BRITISH COLUMBIA
2075 WESBROOK MALL
VANCOUVER, B.C., CANADA
V6T 1W5

FACULTY OF EDUCATION

Scarfe Annex.

February 22, 1980.

Dear Teacher:

It would be greatly appreciated if you would administer the attached Spelling Test to your class as discussed with you when I visited your school.

To ensure uniformity of administration, please follow the procedure as stated:

1. Speak the word.

2. Use the word in a sentence.

3. Repeat the word.

Thank you for your kind assistance with this matter. Once the results have been analyzed, some of the children will be tested further, individually.

Yours sincerely,

Stanley A. Perkins, Ed.D.,
Professor of Education.

SAP/gw

Cecilia Keung

50-WORD SPELLING TEST

To ensure uniformity of administration, please follow the procedure as follows:

1. Speak the word,
2. Use the word in a sentence,
3. Repeat the word.

1. glory
2. Negro
3. width
4. haul
5. breath
6. riding
7. pillow
8. accept
9. cousins
10. difficult
11. exercise
12. treatment
13. habit
14. limit
15. hedge
16. guard
17. defeat
18. polish
19. centre
20. carols
21. pumpkin
22. hurried
23. pavement
24. companies
25. baggage
26. towel
27. stiff
28. hotel
29. potato
30. special
31. grammar
32. exchange
33. climbing
34. backwards
35. image
36. careless
37. unexpected
38. pioneer
39. amount
40. generally
41. guest
42. pleasant
43. control
44. battery
45. worried
46. decorations
47. numerous
48. beginning
49. strength
50. magazine

APPENDIX C

LETTER FOR PERMISSION FROM TEACHERS TO PARENTS

Dear Parents:

As a parent of a grade six student in the Surrey School District, your kind permission is being sought for your son or daughter to participate in a research study on spelling and ways of learning. The researcher is interested in determining how a student's learning ability in spelling relates to different learning strengths of each individual by testing the students, individually.

This study is being conducted by Cecilia Keung for completion of her Master of Arts Degree in Education under the direction of Dr. S. Perkins, Professor of Education, University of British Columbia, and with the permission of Mr. J. Evans, Superintendent of School District #36, Surrey. Your permission for your son or daughter to participate in this study is greatly appreciated, and is completely voluntary.

Please sign and return the form below, if you are willing to have your son or daughter participate in the study.

Thank you for your assistance with this matter.

Sincerely yours,

_____

Principal.

. . . . . .

PLEASE RETURN THIS FORM TO: _____

Name of Classroom Teacher

I hereby give permission for my child, _____

to participate in this research study on spelling and learning strategies.

DATE: _____ PARENT'S SIGNATURE _____